

South Dakota State University

Open PRAIRIE: Open Public Research Access Institutional Repository and Information Exchange

Electronic Theses and Dissertations

1987

The Original Survey Notes of Beadle County as a Geographical Reference

Ralph Jay Borkowski

Follow this and additional works at: <https://openprairie.sdstate.edu/etd>

Recommended Citation

Borkowski, Ralph Jay, "The Original Survey Notes of Beadle County as a Geographical Reference" (1987). *Electronic Theses and Dissertations*. 4432.
<https://openprairie.sdstate.edu/etd/4432>

This Thesis - Open Access is brought to you for free and open access by Open PRAIRIE: Open Public Research Access Institutional Repository and Information Exchange. It has been accepted for inclusion in Electronic Theses and Dissertations by an authorized administrator of Open PRAIRIE: Open Public Research Access Institutional Repository and Information Exchange. For more information, please contact michael.biondo@sdstate.edu.

THE ORIGINAL SURVEY NOTES OF BEADLE COUNTY
AS A GEOGRAPHICAL REFERENCE

by

RALPH J. BORKOWSKI

A thesis submitted
in partial fulfillment of the requirements for the
degree Master of Science, Major in
Geography, South Dakota
State University
1987

THE ORIGINAL SURVEY NOTES OF BEADLE COUNTY
AS A GEOGRAPHICAL REFERENCE

This thesis is approved as a creditable and independent investigation by a candidate for the degree, Master of Science, and is acceptable for meeting the thesis requirements for this degree. Acceptance of this thesis does not imply that the conclusions reached by the candidate are necessarily the conclusions of the major department.

Thesis Advisor Date

Head, Geography Dept. Date

TABLE OF CONTENTS

	page
ILLUSTRATIONS.	iii
CHAPTERS	
I. Introduction	
1.1 Justification for the Study.	1
1.2 Statement of the Problem and the Research Area.	2
1.3 Terms and Process.	4
1.4 Limitations of the Study	13
1.5 Review of Pertinent Literature	14
1.6 Organization of the Study.	18
II. Surveyors and Surveying	
2.1 Introduction	21
2.2 Beadle County Land Surveyors	21
2.3 The Land Surveyors Oath.	25
2.4 The Manuals of Instructions.	27
2.5 Corner Monumentation	31
2.6 Corner Monumentation in Beadle County	33
2.7 Field Notes Recorded by Original Surveyors	35
2.8 The <u>1855 Manual</u> on Running the Line	37
2.9 Township Subdivision	38
2.10 Land Surveyors Tools	40
III. Physical Features	
3.1 Introduction	48
3.2 Topographical Comments	48
3.3 Original Beadle County Topographical Comments	50
3.4 Mapping Beadle County Topographical Comments	51
3.5 Modern Beadle County Topographical Mapping.	54
3.6 Comments on Water from the Original Instructions.	57
3.7 Water in Beadle County	57

	Page
3.8 Required Comments on Soil Quality.	62
3.9 Beadle County Soil Quality.	62
3.10 Original Surveyors Comments on Soil Quality.	64
3.11 Modern Beadle county Soil Quality	64
3.12 Original Surveyors Comments on Sand and Gravel.	66
3.13 Comments on Timber and Grass Required from the Original Instructions.	68
3.14 Timber and Grass in Beadle County	70
IV. Cultural Improvements and General Description	
4.1 Introduction	76
4.2 The <u>1855 Manual</u> on Cultural Improvements	76
4.3 Cultural Improvements in Beadle County.	77
4.4 Cultural Improvements on Beadle County Plats.	78
4.5 The General Description Required from the <u>1855 Manual</u>	78
4.6 General Descriptions of Beadle County Townships.	82
V. Conclusions.	86
SELECTED BIBLIOGRAPHY	91

ILLUSTRATIONS

Figure	page
1. Location of Old and New Beadle Counties in South Dakota	5
2. Initial Point, Principal Meridian, and Baseline.	8
3. Standard Parallels and Guide Meridians.	10
4. Township and Range Lines.	11
5. The Order of Running Section Lines.	13
6. Township Lines in Beadle County, When and Who Surveyed Them	24
7. When the Townships in Beadle County were Subdivided, and Who did the Survey.	26
8. Burt's Solar Compass.	41
9. Beadle County Topography, from the Original Surveyors Notes.	53
10. Modern Topographical Map of Beadle County	55
11. Township Plat from Beadle County Showing Water Features.	60
12. Township Plat from Beadle County Showing Water Features.	61
13. Beadle County Soils Map from the Original Surveyors Notes.	63
14. USDA, SCS Soils Map of Beadle County.	65

	page
15. Soils Overlay of Beadle County.	67
16. Cultural Improvement from Burr Oak Township.	79
17. Cultural Improvement from Wessington Township.	80
18. Cultural Improvement from Whiteside Township.	81

Table

	page
1. Survey of Township Lines in Beadle County	22
2. Subdivision of Townships in Beadle County	23
3. Required Comments in Original Surveying Notes	37
4. Original Surveyors Topographical Comments.	50
5. Original Surveyors Comments Broken into 5 Categories.	51
6. Categories for Soils Overlay.	68

CHAPTER I

INTRODUCTION

1.1 Justification for the Study

There exists a little known and seldom used source of original information for primary geographic research on the state of South Dakota. This source of geographic information is the original land surveyors' notes and township plats for South Dakota found in county courthouses and at the State Archives in Pierre. The original land surveyors notes contain a great deal of information for the geographer willing to research this source of vital historic geographical data.

There is a select group of individuals to whom the original land surveyors' notes and plats are familiar. The members of the group are not geographers, historians, or librarians. Rather, they are highly trained technicians and professionals who practice the art of land surveying.

It is the belief of the author that this excellent source of geographical data should no longer be a "secret" to most geographers and other scholars. One of the basic purposes of this paper is to introduce this

relatively unfamiliar source of geographical information to the state's geographical community.

1.2 Statement of the Problem and the Research Area

It is the intent of the author to present a detailed overview of the great variety and specific types of geographical information that are available within the original land surveyors' notes and plats in a geographical manner. The author believes that these notes and plats have been overlooked for more than 100 years as a source of valuable geographical information. The author believes that these materials have been overlooked primarily because geographers did not realize the amount of material available; neither did they know how to use them and where to find them. These notes and plats create a seldom used, therefore to most geographers, new pool of geographical research data for the interested scholar.

Previously published material concerning the history of land surveying in South Dakota has ignored the original land surveyors' notes and plats as sources of original information. Other works have traced the spread of surveying across the state chronologically; but have not defined the data available in the original notes. The purpose of this paper is to familiarize the scholar and reader with the large amount of geographical data

available in the original notes and plats and suggest possible current applications.

In order to best illustrate the importance of these notes and plats, the author has chosen a geographical area to evaluate and demonstrate their use and value. The area selected is Beadle County in east central South Dakota. The author selected Beadle County as the study area for several reasons. Beadle County is the author's home county, and hence he is familiar with place names and geographical conditions. Additionally, it was easy for the author to conduct on-the-spot research. Also important in Beadle County's selection is the fact that it is not located on the boundary between any two different land survey systems. Another consideration is that the county is not bounded by, or part of, an Indian reservation. The last two criteria are important because they would tend to add additional data recording requirements to the original surveyor. Though the requirement for additional recorded information is important, it would for the purposes of this paper only confuse the reader with unnecessary details.

The original Beadle County was created on January 8, 1873 as a part of Dakota Territory. The area became a part of Brown County, Dakota Territory on October 1, 1879. Present day Beadle County, South Dakota also came

into being on October 1, 1879.¹ Figure 1 identifies the location of old and new Beadle Counties in South Dakota. Beadle County was named to honor Brigadier General William Henry Harrison Beadle, pioneer scholar, surveyor, educator, lawyer, legislator, and soldier. Beadle is responsible for legislation in South Dakota designating sections 16 and 36 of each township as school lands. Income from these two sections is still used to support the state's schools. The present day Beadle County was created from parts of Burchard, Clark, Kingsbury, and Spink Counties of Dakota Territory. The modern county was formally organized on July 9, 1880 and the county seat was established in Huron on July 28, 1880. It was not until November 2, 1889 that Beadle County became a part of a state, when Dakota Territory was divided and the states of North and South Dakota created. The reader should understand that this paper is written about that part of South Dakota that is Beadle County as we know it today.

1.3 Terms and Process

In order to assist the reader in understanding the remainder of this work, several terms must be defined that are unique to the process of land surveying. These terms all build upon one another and result in the completed survey. Therefore, the following order of presentation of terms involved in the surveying

process is utilized. These terms are taken from Surveying Theory and Practice by Raymond E. Davis and Francis S. Foote, and from The Theory and Practice of Surveying by J.B. Johnson.

Land surveying deals with the measuring and marking off of terrain to identify property boundaries. Land is surveyed so that individuals may clearly identify, and therefore claim, land as their own. Land surveyors measure distance and direction, record field notes, calculate the dimension and area of land, and prepare maps of the land surveyed. Surveying field notes consist of the information recorded while the survey is being conducted. The notes are in a form that is easy to interpret by anyone having a knowledge of surveying practices. The notes contain the numerical data, written notes, and hand drawn sketches, all intended to better define the area surveyed. The surveying notes contain the description of the monuments placed, the lengths of all lines run, and the "calls". Monuments are marks left on the surface of the ground that mark the location of corners or points along the line. Monuments may be stones, holes, mounds of earth or stone, posts, bits of buried charcoal, or trees marked in a particular way. It is of foremost importance that these monuments be permanent in nature.

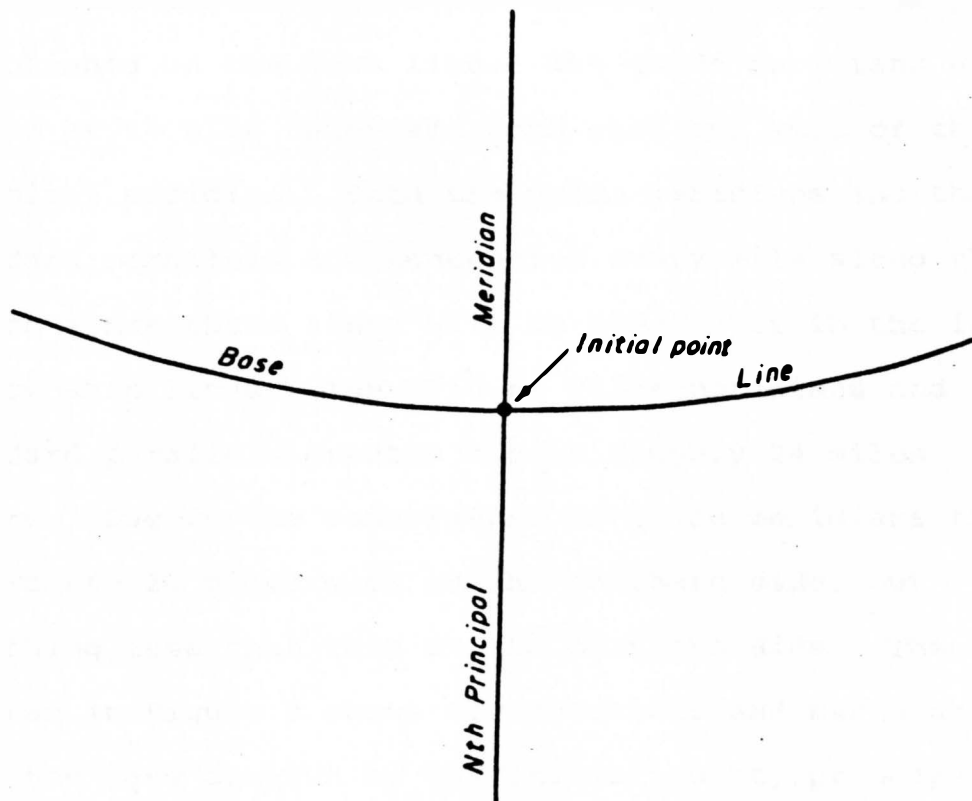
Running the line consists of the actions taken to measure and mark the line from point to point. The line is run using a magnetic compass to determine direction and a steel chain to determine distance. The surveyor's chain is constructed of 100 links, each 7.92 inches in length, making the chain a total of 66.00 feet in length. "Calls" are descriptions of objects along the line. These "calls" are important since they tie the line and the monuments placed to the natural terrain as well as any cultural object that may be on or close to the line. Also included in the notes are: the date and time of the survey; the weather; the names of the field party; the location of the survey; and the purpose of the survey. Notes are to be neat and clearly written in a form that will not cause confusion to any later user of the notes.

The initial point of a survey system is the point from which all measurements begin. The initial point is determined by astronomical observations. A principal meridian is located along a true meridian of longitude and runs through the initial point of the survey system. The principal meridian is a line extending both north and south as far as required to include the area of the survey system. A base line is located along a true parallel of latitude and runs through the initial point of the survey system. The base line extends east and west far enough to include the area of the survey system.

The initial point, the principal meridian, and the base line are all monumented so that they are permanent and easy to locate by subsequent surveyors. Figure 2 illustrates how the initial point, principal meridian, and base line create the base pattern for the rectangular survey system.

Figure 2.

Initial Point, Principal Meridian, and Base Line.

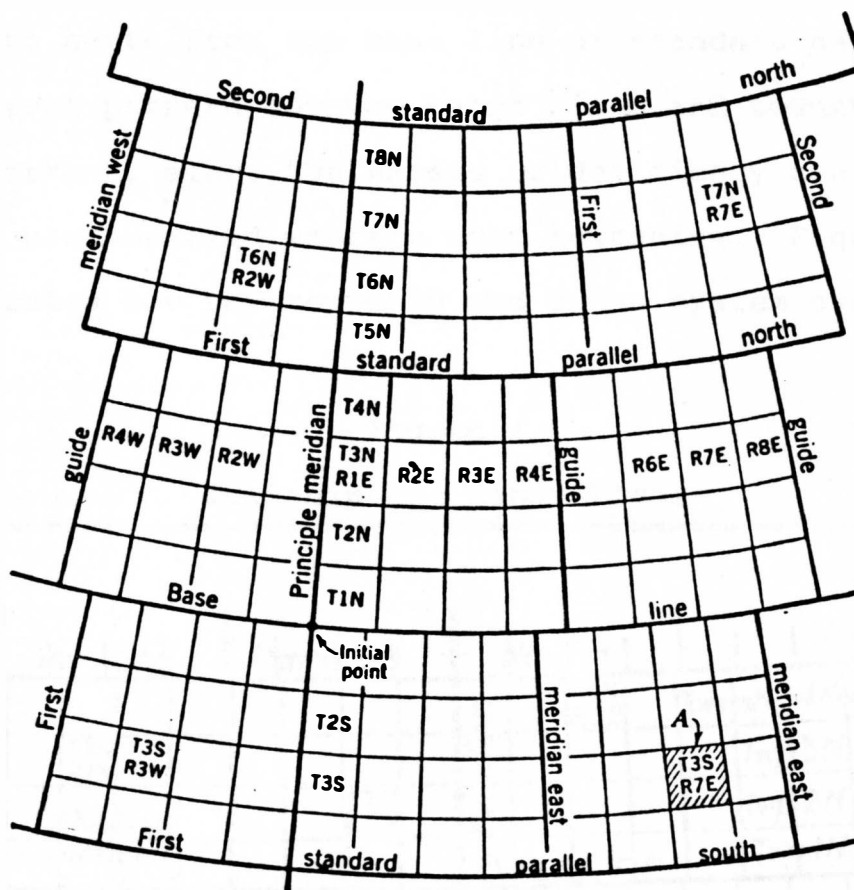


The next step in establishing a survey system is to lay out standard parallels. These standard parallels (sometimes called correction lines) are perpendicular to the principal meridian and spaced at 24 mile intervals north and south of the initial point on the base line to control the area of the survey system. These standard parallels are true parallels of latitude extending east and west of the principal meridian. Next guide meridians are established parallel (as parallel as they could be run with a magnetic compass) to the principal meridian. These guide meridians are run north and south from points established on the base line. The guide meridians are spaced at 24 mile intervals both east and west of the principal meridian. Both the guide meridians and the standard parallels are monumented every mile along their length since these lines will be used later in the layout of township lines. The grid of guide meridians and standard parallels creates blocks roughly 24 miles square. Due to the convergence of guide meridians these blocks are 24 miles wide on the southern side, but something less than this on the northern side. The diagram in Figure 3 shows how parallels and meridians fit onto the base created by the initial point, principal meridian, and base line.

The next step in the process of establishing the survey system is to lay out townships. These 6 mile

Figure 3

Standard Parallels and Guide Meridians

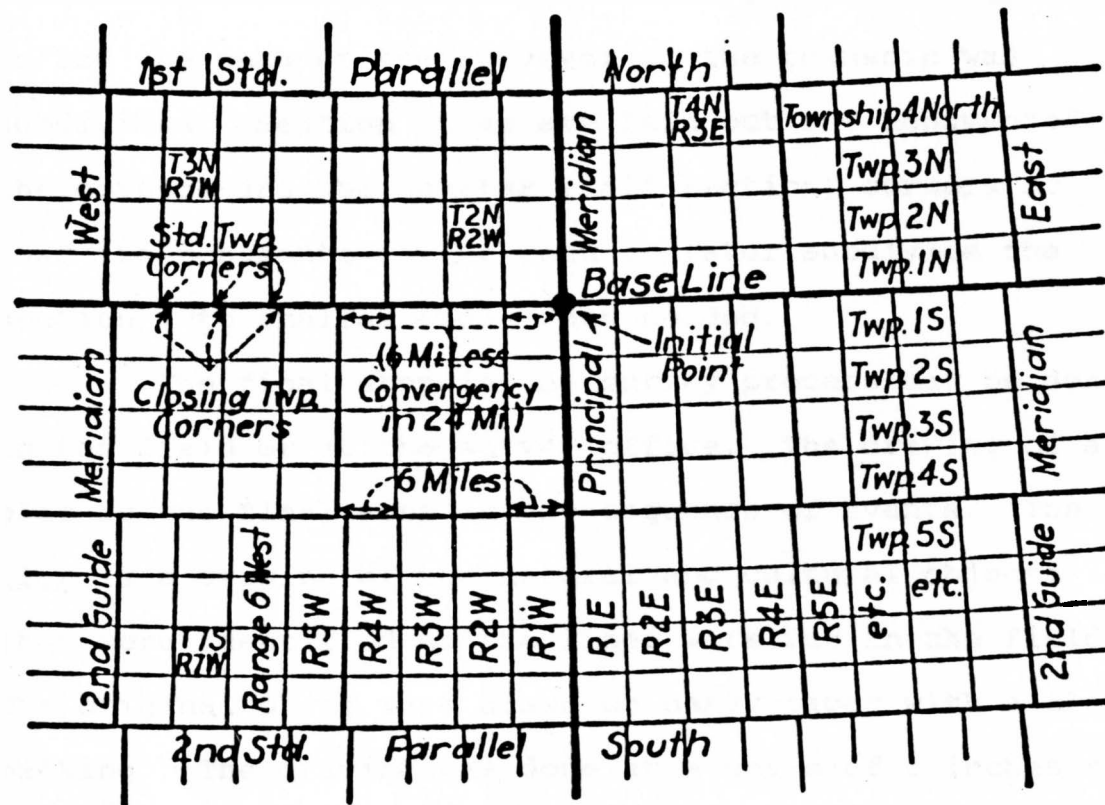


square blocks of land are created when range lines and township lines are laid out. Range lines run north from the base line and the standard parallels up to, but not across, the next standard parallel. They are spaced at 6 mile intervals, with the lines being run from the south to the north, and from the east to the west. Township lines are laid out parallel to the base line and standard

parallels. East and west township lines are laid out from east to west from the principal meridian or guide meridian. North and south range lines are laid out from south to north from the base line or standard parallel. The layout pattern for the range lines and township lines is important, since the excess or deficiency can be found in the northern and western most townships. Figure 4 illustrates how the township and range system overlays

Figure 4

Township and Range Lines



the standard parallels and the guide meridians. All of these range lines and township lines are monumented every mile along their length since these monuments will be used in the next step -- the layout of sections.

The next step in the process is to lay out the sections and section lines. The sections are each roughly one mile square. The layout begins in the southeast corner of the township with all measurements being made from the southern and eastern boundaries of the township. Figure 5 illustrates, numerically, the pattern by which a township is subdivided. The numbers follow the path of the surveyor as the township was subdivided. Section lines are laid out and monumented at the corners and the quarter (half section) corners so that the monuments may be used to later subdivide the section into smaller areas when needed.

The final step in the survey process may be done in the field or at the survey office. The drawing of a plat is the final step in the sequence of events. The plat is a drawing of the natural and cultural objects that were identified as the lines were run in the field. The original plats were drawn on heavy paper with a cloth backing. The drawing was done at a scale of 2 inches to the mile. Other data included on the plat were the date of the survey, the township and range number of the

County in order that the research could come to an identifiable end. Had the study area covered all of eastern South Dakota, or perhaps the whole state, the accuracy of the conclusions may have been improved. However, the amount of data to be dealt with would have increased a hundredfold. An increase in the size of the data set would not, necessarily, have improved the results of the study if the sample area was selected accurately.

Increasing the size of the data set would have greatly increased the time required for data collection and manipulation. Since the study area was limited to Beadle County, there may be localized trends in the data that would not show up until a greater area was evaluated. It should be remembered that the area was selected simply to demonstrate the use of the original field notes and plats, not to produce a definitive study of surveying in South Dakota.

1.5 Review of Pertinent Literature

Numerous pieces of literature have been written concerning the history of land surveying in the state of South Dakota. Those that apply directly to this work are reviewed here.

Roscoe L. Lokken in Public Land Disposal, traces the progress of public land surveying in the state of Iowa. Public land surveying began in March of 1832 and

by 1860 all of the township lines in Iowa had been run. By 1866 the subdivision of all of the townships in the state had been completed and the Office of the Surveyor General was closed. The remaining chapters of the book explain the ways the citizens gained ownership of the public land. This work applies here because the dates of survey and the physical location of the state of Iowa are both close to South Dakota. It therefore provides an excellent starting point for this research.

Hildegard Binder Johnson, in Order Upon the Land, presents a complex review not only of land surveying, but also of the landscape that has resulted following the rectangular land survey. The author believes that Johnson best summarizes her work in the Preface of her book:

Order Upon the Land deals with some of the characteristics inherent in rectangular survey systems and looks at the survey in the context of the rationalism of the eighteenth century. Then, after discussing early land ordinances, the book treats the emergence of the survey landscape topically. An attempt is made to bring the past alive as part of the present landscape. The landscape of the Upper Middle West, of course, has been affected by many other forces besides the original survey. But this book is not an essay on the general history of a region; it is an interpretation of one influence in a region's historical-geographical development.²

The Administration of the Public Domain in South Dakota is a doctoral dissertation written by Charles Lowell Green at the State University of Iowa. This work details

how public land in South Dakota was made available for ownership by private individuals. The paper discusses the different methods by which settlers could legally own land (homesteads, tree claims, land bounties, and land grants). Chapter II of the dissertation deals with the public land surveys of Dakota. The chapter consists of a chronology of events that led up to, and through, the public land surveys of the state. Included in Appendix B are a series of maps that show the spread of the public surveys between 1861 and 1918.

William D. Pattison, in Beginnings of the Rectangular Land Survey System, 1784-1800, traces from its very inception the history of the American land survey system as we know it today. Pattison did extensive research to be able to document each stepping stone that led to the use of mile square sections and six mile square townships, as well as the systems of numbering and subdivision that are used today. This book, though not applying directly to the author's work, is an invaluable reference for anyone who is interested in the history of the American land survey system.

Erich Fruehauf published in Kansas History, A Journal of the Central Plains, an article titled "Early Surveys in Kansas." This brief article contains a loosely written history of land surveying in Kansas. Land surveying in Kansas began in 1854 and for the most part was complete

in 1877. This paper is similar, though not in nearly the detail, to the book written about land surveying in Iowa and to the dissertation written on the same topic for the state of South Dakota (both reviewed above.)

C. Albert White, in A History of the Rectangular Survey System, authored a Government publication that could be called the "last word" in histories of land surveying. The book, instead of using footnotes, reprints the references within the text. The book contains numerous complete works, and portions of many others. The book, as the title states, is a written history of the rectangular land survey system in the United States. White was very thorough in his research. The volume was particularly helpful to this author because of the inclusion of reprints of the early manuals of instructions from the Commissioner of the General Land Office to the Surveyors General of the United States. These manuals of instructions tell the surveyors how their work is to be done.

Lowell O. Stewart, in Public Land Surveys: History, Instructions, Methods, has written a detailed history of the public land surveys that have been done in the United States. This book is similar to A History of the Rectangular Survey System in its use of lengthy quotations from original works. What makes this book unique is that it directly compares the sequence of manuals that guided the

Deputy Land Surveyors. This comparison makes it easy to find changes between successive manuals.

1.6 Organization of the Study

During the course of this study a great deal of data was gathered. It is not unusual for this to be done in support of thesis research. What may be unusual, or perhaps unfamiliar to the reader, is the source of the data.

Data were gathered from the original land surveyors field notes and the plats that were drawn from the notes. The field notes for Beadle County are bound in twelve different volumes. Generally one volume contains the field notes from two or three different townships. The field notes are hand written, in ink, and in a writing style unique to the late 1800's. This writing style can at times be very difficult to read. The plats are hand drawn on a heavyweight paper with a cloth backing. Each township is on a separate plat, drawn to a scale of two inches to the mile.

The information gathered for the purposes of this paper required the author to look for specific comments within the notes. Depending on the chapter of the paper being worked on, the author may have been looking for a comment about soil quality, timber, monumentation, water, or a cultural improvement. Each of these different topics of concern has its own place within the notes for each and every township within the study area.

This paper was written in the hope of more clearly identifying the usefulness of the original land surveyors notes and plats. Toward this end, the information in the following chapters is presented. Chapter II presents background information concerning the land surveyors of Beadle County and explains the work that they accomplished as they surveyed the plains of Dakota. Building on this foundation, Chapter III examines the physical features that the land surveyors encountered as they surveyed Beadle County. For the purposes of this work, physical features include the county's topography, water, soil, timber and grass. Once the physical features have been explained, Chapter IV examines the cultural features found in Beadle County by the original surveyors. These cultural features, few as they may be, are an important part of the geographical history of Beadle County. The remainder of Chapter IV evaluates the last task accomplished by each land surveyor prior to his departure from the township. This task was to write a general description of the township, incorporating comments about both its physical and cultural characteristics. The Conclusion, Chapter V, summarizes Chapters II through IV, comments on the usefulness of the study, and suggests further research work.

CHAPTER I END NOTES

¹John H. Long, ed.. Historical Atlas and Chronology of County Boundaries. 5 vols. (Boston: G.K. Hall & Co., 1984), Vol. 5: Minnesota, North Dakota, South Dakota, comp. Mark P. Donovan (North and South Dakota) and Jeffrey D. Sibert (Minnesota), p. 292.

²Hildegard Binder Johnson. Order Upon the Land, (New York: Oxford University Press, 1976), Preface.

Chapter II

SURVEYORS AND LAND SURVEYING

2.1 Introduction

This chapter introduces the men who surveyed in Beadle County and the Manuals of Instructions that guided their work. This is followed by a discussion of the requirements set forth in those Manuals of Instructions. In this part of the paper, emphasis is placed on the 1855 Manual of instructions since it was used by the original surveyors as their primary reference when they surveyed Beadle County. The 1855 Manual is used as the starting point for the remainder of the chapter. The 1855 Manual is referenced to describe the monuments placed in the county as well as the form and content of the field notes gathered as the county was surveyed. This chapter concludes with discussions of: the process of 'running the line'; the method of township subdivision; and the land surveyors tools that were used to run the line.

2.2 Beadle County Land Surveyors

Beadle County was surveyed by a group of skilled tradesmen. These men were trained in all aspects of land surveying; they were also experienced outdoorsmen, having lived off the land as they did. They had none of the

conveniences that we all accept today as part of our way of life. They worked hard, and they lived a hard life on the prairie.

The men who surveyed Beadle County were rugged outdoorsmen, as well as being skilled technicians in their field. These technicians laid out the townships that were to become Beadle County between 1868 and 1881. During this 13 year period six different men laid out the township lines for Beadle County's 35 different townships. Table 1 identifies: the names of the men who did the work; the number of township lines that they laid out; and the dates that they worked in Beadle County.¹

TABLE 1

SURVEY OF TOWNSHIP LINES IN BEADLE COUNTY²

<u>SURVEYOR</u>	<u>NUMBER OF TOWNSHIP LINES RUN</u>	<u>RESPECTIVE DATES OF SURVEY</u>
M.K. Armstrong	5	Oct 1868
Miles T. Wooley*	29	Aug-Oct 1871
Miles T. Wooley*	1	Oct 1872
Augustus High	26	Aug-Sept 1873
Horace J. Austin	9	Sept 1873
Joseph Allen*	10	Jul-Aug 1875
T.F. Marshall	2	Oct 1881

* NOTE: Joseph Allen and Miles T. Wooley were the only two people to both lay out townships and subdivide townships, (refer to Table 2.)

Marshall Oct 81	Allen Aug 75	Allen Aug 75	Allen Aug 75	Allen Aug 75	Allen Aug 75	Austin Sept 73
Nance Allen Aug 75	Bonilla Allen Aug 75	Altoona Allen Aug 75	Pleasant View Allen Aug 75	Lake Byron Allen Jul 75	Milford Woolley Oct 72	Barrett Austin Sep 73
Woolley Sep 71	Woolley Sep 71	Woolley Sep 71	Woolley Sep 71	Woolley Sep 71	Woolley Aug 71	Woolley Aug 71
Whiteside High Sep 73	Allen High Aug 73	Broadland High Aug 73	Fairfield Woolley Aug 71	Iowa Woolley Aug 71	Liberty Woolley Sep 71	Foster Austin Sep 73
High Sep 73	High Aug 73	High Aug 73	High Aug 73	Woolley Aug 71	Woolley Aug 71	Austin Sep 73
Wessington High Aug 73	Wolsey High Aug 73	Hartland High Aug 73	Theresa Woolley Aug 71	Valley Woolley Aug 71	Cavour Woolley Aug 71	Banner Austin Sep 73
High Sep 73	High Aug 73	High Aug 73	High Aug 73	Woolley Aug 71	Woolley Aug 71	Austin Sep 73
Sand Creek High Aug 73	Vernon High Aug 73	Dearborn High Aug 73	Clyde Woolley Aug 71	Custer Woolley Aug 71	Richland Woolley Aug 71	Logan Austin Sep 73
High Sep 73	High Aug 73	High Aug 73	High Aug 73	Woolley Aug 71	Woolley Sep 71	Woolley Sep 71
Burr Oak High Aug 73	Kellogg High Aug 73	Carlyle High Aug 73	Grant Woolley Aug 71	Clifton Woolley Aug 71	Pearl Creek Woolley Sep 71	Belle Prairie Austin Sep 73
Armstrong Oct 68	Armstrong Oct 68	High Aug 73	High Aug 73	Armstrong Oct 68	Armstrong Oct 68	Armstrong Oct 68

Figure 6. Township Lines in Beadle County; who surveyed them and when the work was done.⁵

each subdivided; and the dates that each worked in the Beadle County area.⁴

Figure 7 shows an outline map of Beadle County. Shown on the map are the names of the men who subdivided townships in Beadle County and the month and the year the work was done. As was the case with the township lines, on occasion a township may have been subdivided (in whole or part) on two different dates. This work would have been done if the corner monuments had been lost or destroyed, or if it was determined that the original surveyor had made gross surveying errors. For the purposes of this paper, only the date of the original work is recorded.

2.3 The Land Surveyors Oath

Though there is no reason to question the integrity of the men who surveyed in Beadle County, there were occasions on which the Surveyor General of the United States would receive work from the field that obviously was not accomplished as required. As a result, the Surveyor General devised a plan to attempt to control the Deputy Surveyors and through them the other surveying crew members. The plan consisted of a set of official oaths that all surveyors and crew members were required to take. These oaths were found in the 1851, and

Nance Mellen Apr 1882	Bonilla VanAntwerp Aug 1877	Altoona VanAntwerp Aug 1877	Pleasant View Allen Aug 1875	Lake Byron Allen Aug 1875	Milford Allen Jul 1875	Barrett VanAntwerp Jul 1875
Whiteside Bates Sep 1881	Allen VanAntwerp Aug 1877	Broadland Greene Aug 1874	Fairfield Blanding Jun 1874	Iowa VanAntwerp Aug 1874	Liberty VanAntwerp Aug 1874	Foster VanAntwerp Sep 1874
Wessington Bates Sep 1881	Wolsey VanAntwerp Aug 1877	Hartland Greene Aug 1874	Theresa Blanding May 1874	Valley VanAntwerp Aug 1874	Cavour VanAntwerp Aug 1874	Banner VanAntwerp Sep 1874
Sand Creek Bates Aug 1881	Vernon VanAntwerp Aug 1877	Dearborn Greene Aug 1874	Clyde Blanding May 1874	Custer VanAntwerp Aug 1874	Richland VanAntwerp Sep 1874	Logan VanAntwerp Sep 1874
Burr Oak Wooley Oct-Nov 1881	Kellog Greene Jul 1874	Carlyle Blanding May 1874	Grant Blanding May 1874	Clifton VanAntwerp Jul 1874	Pearl Creek VanAntwerp Oct 1874	Belle Prairie VanAntwerp Sep 1874

Figure 7. When the Townships in Beadle County were surveyed, and who did the work.⁶

subsequent Manuals of Instructions.⁷ The oath required that all involved individuals swear to, and sign in the field note book, that the work accomplished had been done to the best of their ability and according to the requirements of the current manual of instructions.

The use of this oath protected the government from the unscrupulous individual who might choose not to ever go to the field, yet still turn in all of the required documents as if the work had been accomplished. The use of an official oath by the Surveyor General does not imply that all surveyors tried to cheat the government. The oath provided the government with a means of possible return of funds from the individual who lied to and cheated the government on a surveying contract.

2.4 The Manuals of Instructions

As is always the case with any technical discipline, a source of reference information was available for the early surveyor. This source of reference material came in several forms. Any time the United States Surveyor General had a change of surveying policy to disseminate he put out a letter, circular, or manual with the new information. In most cases the letters dealt with one specific issue and would not be applicable to all State Surveyor Generals. However, the

circulars and manuals were widely distributed. Of all of the publications issued prior to the completion of the surveying in Beadle County, the four that most directly applied are listed and briefly reviewed here.

1. General Instructions: Office of the Surveyor General of Wisconsin and Iowa, issued in 1851; hereafter called the 1851 Oregon Manual.
2. Instructions to the Surveyors General of Public Land of the United States, for those Surveying Districts Established In and Since the Year 1850; Containing, also, a Manual of Instructions to Regulate the Field Operations of the Deputy Surveyors, Illustrated by Diagrams, issued in 1855; hereafter called the 1855 Manual.
3. Instructions to the Surveyors General of the United States, Relating to their Duties and to the Field Operations of the Deputy Surveyors, issued in 1864 but not printed and distributed until 1871; hereafter called the 1871 Instructions Circular.
4. Instructions of the Commissioner of the General Land Office to the Surveyors General of the United States Relative to the Survey of the Public Lands and Private Land Claims, issued in 1881; hereafter called the 1881 Instructions Circular.

The 1851 Instructions Circular was the first official Manual of Surveying Instructions issued in the United States. This manual, written by John M. Moore, Principal Clerk of Surveys, laid out the rectangular land survey system as we know it today. The manual did not, however, contain the needed detail to make it historically important. Though the manual was written to

the Surveyor General of Oregon, its use was also required through the rest of the states and territories.⁸ This manual had little impact on Dakota Territory, since only one township in the state was surveyed under this circular.⁹

The 1855 Manual (the first true "manual" of surveying instructions) prepared by the Principal Clerk of Surveys, John M. Moore, was officially issued on February 22, 1855. This Manual of Instructions to Regulate the Field Operations of Deputy Surveyors set the standard for surveying practices that have continued to the present. The 1855 Manual told the surveyor how to lay out the system of base lines and principal meridians as well as the layout of standard parallels and guide meridians. The 1855 Manual also laid out the original standard practices for monumentation, closure practices, and surveying equipment required. Even though these last three items have matured through the years to keep pace with modern technology, the original technical details were presented in the 1855 Manual.¹⁰

The 1871 Instructions Circular was, as its title implies, an Instructions Circular sent out to the Surveyor Generals of the United States.¹¹ The circular did not make any noteworthy changes in land surveying that affected Beadle County, Dakota Territory. Note that this was an Instructions Circular and not a Manual of

Instructions; the latter having direct impact on the day-to-day operations of Deputy Land Surveyors.

In 1880 a group of United States Surveyor Generals met to revise the 1855 Manual. The result of their meeting was the 1881 Instructions Circular. The circular was originally intended to replace the 1855 Manual; however, when it was fielded, it was found to be inadequate. Since the circular made no real changes to the 1855 Manual, and was never enacted into law, it was not widely used.¹²

Each of these different publications describe in detail the work that the surveyors were to record while they surveyed the land. The 1855 Manual contains a Manual of Instructions to Regulate the Field Operations of Deputy Surveyors and therefore is the manual that applies for the work done in Beadle County, South Dakota. Since neither the 1871 Instructions Circular or the 1881 Instructions Circular made noteworthy changes, neither was used -- that leaves the 1855 Manual as the document having the most impact on land surveying in Beadle County. Therefore, for the purposes of simplicity of description, the author used only the 1855 Manual as a technical and historical reference since most (30 of the 35) townships in Beadle County were surveyed under its guidelines.

2.5 Corner Monumentation

To this point, the chapter has addressed the men who did the surveying in Beadle County and the basic set of rules which they were to follow. Attention will now be given to the tasks that they performed as they surveyed. This next section reviews the 1855 Manual guidelines pertaining to corner monumentation and then examines the original notes for Beadle County to see what types of monuments were placed in the county.

The 1855 Manual states that trees, wooden posts, stones, and mounds of earth may be used to monument corners. Trees that were directly on the corner were to be barked and shaped so that they would have four flat faces. The tree was shaped so that it could be marked on the flat surfaces with the appropriate numbers to indicate distance from the township boundaries. If a tree was not available, then a post could be set for a corner monument. Posts set were to be of a minimum four inches in diameter and shaped and marked in a manner similar to that prescribed for trees on a corner. If timber was not available, then a stone could be set as a corner monument. A stone set was to be at least 504 cubic inches (14 X 12 X 3 inches) in size and marked with a chisel in the manner designated in the manual. The stone was to be laid in the ground to a depth of seven or eight inches (so that the surface of the stone was still

visible) with the major dimension of the stone being north and south.

In areas where trees, lumber, or stones were unavailable close to the corners, the use of soil to create pits and mounds was acceptable. The 1855 Manual explained a system of pits and mounds of earth that could be used to monument survey corners. The pit was to be dug in a rectangle (actually, a square) shape surrounding the corner to be monumented with the soil dug up to be piled on top of the corner. This rectangular pit (better called a trench) was to be one spade in width and depth and five feet on a side.

The 1871 Instructions Circular replaced the trench with a system of pits. These pits were to be eighteen inches in width, two feet in length, twelve inches deep and six feet from the post, at township corners. Depending on the location of the monument in the township, the pits were to be oriented differently. The different uses of these pits and mounds monuments include monuments common to four townships, to four sections, to two townships, or to two sections. The soil that was dug out was to be placed in a pile that directly covered the corner. The pile of soil was to be covered with the sod dug from the trench (or pits) so that it would better withstand the weather. Under the mound of soil was to be buried either a marked stone, a handful of charcoal, or a

charred stake, exactly at the point of the corner. As an interesting sidelight, the 1855 Manual stated that the surveyor should plant fruit tree seeds at the corners where he had built the pit and mound monument so that, in time, the corner would be covered by a small clump of trees. This was an attempt to do two things: first, to lengthen the life of the monument; and second, (the author believes) to bring trees to the 'desolate prairies.' Nowhere in the notes for Beadle County is there an indication that fruit tree seeds were planted at corners. Being the independent souls that they were, each surveyor had a different style of monument that he placed in the field.

2.6 Corner Monumentation in Beadle County

The following examples show some of the different types of monuments that were used in Beadle County.

From Pearl Creek Township, surveyed by Edwin H. VanAntwerp:

Deposited limestone 8 X 8 X 2 ins marked X and built mound 4 (and one half) ft dia 2 ft high 4 pits 2 ft sq 1 ft deep at corner to sec 25, 26, 35, 36 and drove post 2 ft long 2 ins sq 1 ft in ground in southeast pit.¹³

From Liberty Township, surveyed by Edwin H. VanAntwerp:

Intersected 3rd standard parallel 23.55 chs east of corner to sec 35 and 36 T 113 N, Range 60 West and deposited limestone 4 X 3 X 2 ins. marked X and built mound 4 (and one half) ft dia 2 ft high 3 pits 2 ft sq 1 ft deep for closing corner to sec 1 and 2, T 112 N, R 60 W and drove post 2 ft long 2 ins sq in east pit.¹⁴

From Barrett Township, surveyed by Edwin H. VanAntwerp:

Drove charred stake and set post 4 ft long 3 ins sq 1 ft in ground in mound 4 (and one half) ft dia 2 ft high 4 pits 2 ft sq 1¹⁵ ft deep for corner to sec 25, 26, 35, and 36.

From Milford Township, surveyed by Joseph Allen:

Set granite 14 X 9 X 7 marked (one quarter) raised mound 4 (and one half) ft at base 2 ft high -- dug 4 pits¹⁸ 18 ins sq 1 ft deep for (one quarter) sec cor.¹⁶

From Grant Township, surveyed by James C. Blanding:

Deposited pint of charcoal and set post 4 ft long 4 ins dia 1 ft in ground in mound 4 (and one half) ft dia 2 ft high 4 pits 2 ft sq 1¹⁷ ft deep for corners to sec 23, 24, 25, and 26.

From Nance Township, surveyed by John N. Mellen:

Set post -- 4 ft long, 4 ins sq. with marked stone. 1 ft in ground for corner to secs. 26, 27, 34, and 35 marked:

T. 113 N.	S. 26 on NE
R. 65 W.	S. 35 on SE
	S. 34 on SW and
	S. 27 on NW face

with 2 notches on E. and 1 notch on S. edges, dug pits 18 X 18 X 12 ins. in each sec. 5 (and one half) ft dist. and raised mound of earth 2 (and one half)¹⁸ ft high 4 (and one half) ft base around post.

All of these different types of monuments are described in the 1855 Manual. The monuments are all self-explanatory with one possible exception. On the post in the description from Nance Township, the notes say that it was notched. These notches correspond with the distance to the southeast corner of the township.

The monument is two miles from the eastern boundary and one mile from the southern boundary of the township.

The author should have taken time to search out several of these monuments. However, he has elected to rely on personal experience to relate to the reader the permanence of monuments in South Dakota. It is common for present day land surveyors who rely on the original field notes to find original monuments. The monuments most commonly found are stones, due of course to their permanence. Also found in South Dakota are charred stakes, bearing trees, wooden stakes, and even on occasion, a pit and mound type monument. The mounds are seldom found due to erosion; however, the two, three, or four pits, depending on the type of corner, are found on occasion.

2.7 The Field Notes Recorded by the Original Surveyor

As the original surveyor was at work in the field, he was responsible for collecting a great deal of data. In order for the information to be of any use, it had to be organized so that almost anyone could look at his notes and easily gather pertinent information. More important than the format of the notes, was the kind of information to be gathered. The following paragraphs discuss the kinds of information that the surveyor was to gather, as well as a mention of the format in which data were presented.

In regard to the information to be gathered in the field notes the 1855 Manual states:

They. . . must be a faithful, distinct and minute record of every thing done and observed by the surveyor and his assistants, pursuant to instructions, in relation to running, measuring, and marking lines, establishing boundary corners, &c.; and present, as far as possible, a full and complete topographical description of the country surveyed, as to every matter of useful information, or likely to gratify public curiosity.¹⁹

The 1855 Manual required comments on a variety of different topics of interest. At least some of the information was collected solely for the use of the incoming settler, that is, information that would be "likely to gratify public curiosity."

Table 3 contains a summary of the objects and other data that the surveyor was required to comment on in the field notes as the survey was being conducted. Of this rather long list of items, several also required comments in the general description (item 20 on the list) of the township. Chapter IV of this paper contains a more detailed discussion of the content of the general description.

The 1855 Manual also included detailed examples of the different types of work that the surveyor had to produce. These examples provided the format for the

actually handled the chain (used to measure distance) while a third ran the instrument (usually a compass on a tripod) ensuring that the line was run in the correct direction. A fourth man (and sometimes a fifth) built the monuments required at the corners of sections or townships. The use of an additional man may have been required to clear obstructions along the line in front of the chaining crew.

In the way of land surveying trivia, a review of the surveying notes from Beadle County revealed that in thirty townships two men ran the chain, in one township three men ran the chain, and in the remaining four townships four men ran the chain. Further research revealed that in one township, only one man was employed as a mound builder (undoubtedly a township where stones were used as monuments), while in seventeen townships two men were similarly employed, while in the remaining fifteen townships three men did the pick and shovel work of digging pits and building the mounds for the survey.²¹

2.9 Township Subdivision

The activities required in running the line were done both on township border lines and in the subdivision of townships into sections. Running the line included not only the actual chaining of the line, but also the order by which a piece of ground six miles on a side was divided into thirty-six separate sections. This

subdivision of a township was not done haphazardly. It was done by a specific method so that any retracement of lines at a later date would be simplified.

The survey crew started subdivision for a township in the section at the south east corner of the township by running the east and south section lines on the border of the township to verify the work of the previous surveyor and to check to see if the variation of the magnetic needle had changed. Once this work was complete and any needed adjustments were made, the surveyor would commence north between section 36 and section 35. At the first mile north, he would turn east and run line to the township border. Upon reaching the border he would check his work back west one mile and then run a mile north and a mile east, repeating this process until he reached the last section in the eastern row of sections. The reader may refer to Figure 5 to see an illustration of this process.

Section one in the township would accumulate any error that there may have been in the row of sections. This error was to be placed in the last half mile of the northernmost section in the row. Once the crew was done with the first row of sections they would return to the southern border of the township and repeat the process north for the next row of sections to the west. This procedure would be repeated three more times. The last

two rows of sections were done slightly differently, since the westernmost row of sections would, like the northern tier of sections, accumulate the error that may have occurred in the laying out of the township. As with the northern tier of sections, the western half section in each would accumulate any error (short or long) from the row of sections. The excess or deficiency was directed to be put in the extreme north and west half sections. In this way the rest of the township would have sections of a full 640 acres (or as nearly as possible.)

2.10 Land Surveyors' Tools

The land surveyors' tools were important in the running of the line. The 1855 Manual states that "Burt's Improved Solar Compass, or the instrument (sic) of equal utility, must be used of necessity in such cases; and it is deemed best that such instrument should be used under all circumstances."²² Figure 8 shows a diagram of Burt's Improved Solar Compass.

Burt's Improved Solar Compass has two major components: sight wires and a magnetic compass. The sight wires are used to sight along the line while the compass is used to determine the direction of the line. The 1855 Manual included a discussion on the variation inherent in the magnetic compass.

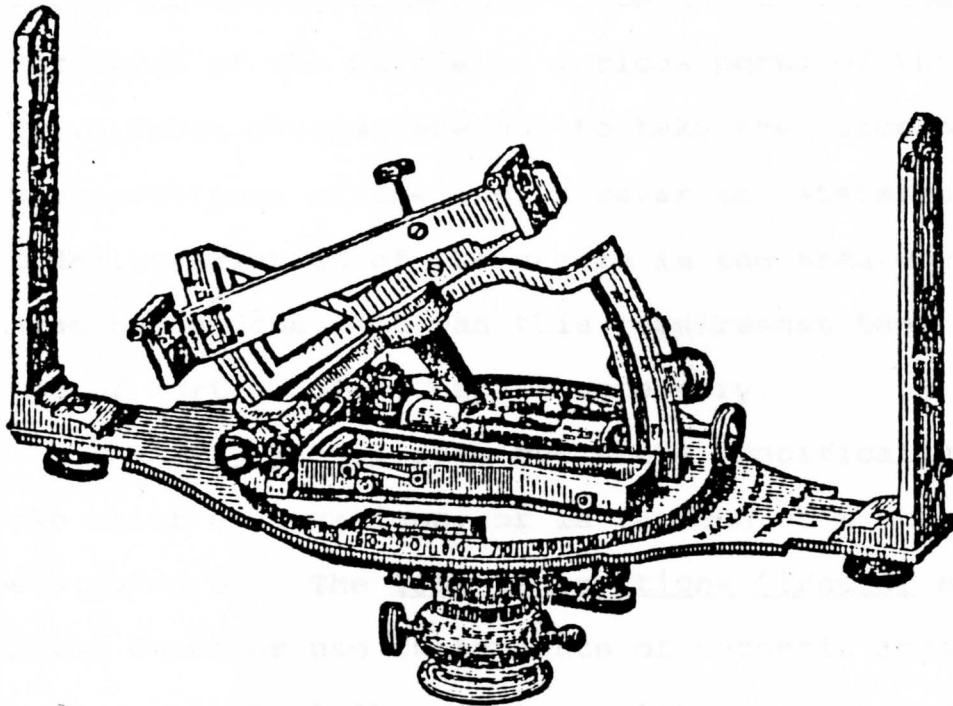


Figure 8. The above diagram shows Burt's Solar Compass. This is reproduced from the Manual of the Principal Instruments Used in American Engineering and Surveying, page 71.

The variation of the magnetic needle was of great interest to the early surveyor, since he ran the section lines using the magnetic needle in areas where the magnetic needle was not adversely affected by some anomaly of nature. The manual contains charts that show the variation of the needle in various parts of the country. These charts were not to take the place of daily observations of the sun, however to determine the exact daily variation of the needle in the area where the work was being done. It was this requirement that made the use of Burt's Solar Compass necessary.

The 1855 Manual does not state specifically how to take solar observations, or is the sun or a star was to be sighted on. The 1881 Instructions Circular states: "Whenever deputies use instruments of magnetic apparatus only, they must test the accuracy of their work and the condition of their instruments by at least three observations upon a circumpolar star, upon different days, between the commencement and the close of surveying operations in any given township."²³

Besides Burt's Improved Solar Compass, one more tool was important to the pioneer surveyor -- the chain. The 1855 Manual states that all township lines and subdivision lines were to be run using a chain two poles in length.²⁴ A two pole chain is 33 feet long. However, the 1855 Manual does note that on level prairie a four

pole chain may be used. The four pole chain is 66 feet long. The chains were used all day, every day, and as a result they undoubtedly would wear. Due to their link type construction, this would increase their length. As a result, the survey chief was directed to have available for daily use a standard chain with which he could check the length of the chain. Any discrepancy in the length was to be recorded in the field notes and the daily use chain was then corrected to the proper length.

One more valuable tool used extensively by the surveyors was a set of tally pins. Tally pins are made of heavy steel wire, one-eighth to one-quarter inch in diameter. The pins are formed so that each is straight with the exception of a loop or eye bent into one end. This loop makes the pin easier to handle, and it may be used to tie a piece of cloth for a flag to make the pin easier to see. The opposite end of the pin is sharpened to make it easier to stick into the ground. A set of tally pins was used by the chaining crew to mark every thirty three or sixty six feet (depending on the length of the chain being used) as they chained along the line.

The tools used by the surveying crew were few, but they were not necessarily simple. The use of an improved solar compass required that the user be trained and knowledgeable in its use.

This concludes the discussion concerning land surveyors and the work that they were directed to accomplish by the Manuals of Instructions that guided their work. The following chapter examines the physical features that land surveyors encountered as they surveyed Beadle County.

CHAPTER II END NOTES

¹"Field Notes [with accompanying plat] of the Survey of the Subdivisional Lines of Township... North, Range... West of the 5th Principal Meridian, Dakota Territory." Sub-divisions, Dakota: Vols. 77, 80, 121, 122, 141, 150, 153, 155, 169, 265, 266, 324. (Handwritten.)

²Ibid.

³Ibid.

⁴Ibid.

⁵Ibid.

⁶Ibid.

⁷U.S. Department of the Interior, Bureau of Land Management, A History of the Rectangular Survey System, by C. Albert White, (Washington, D.C.: U.S. Government Printing Office, 1983), page 467.

⁸Ibid., p. 115.

⁹"Field Notes..."

¹⁰U.S. Department of the Interior, Bureau of Land Management, A History of the Rectangular Survey System, by C. Albert White, (Washington, D.C.: U.S. Government Printing Office, 1983), page 119.

¹¹Ibid., p. 149.

¹²Ibid., p. 161.

¹³VanAntwerp, Edwin H., Deputy Surveyor, "Field Notes [and accompanying plat] of the Survey of the Subdivisional Lines of Township 109 North, Range 60 West of the 5th Principal Meridian, Dakota Territory," Sub-divisions, Dakota: Vol 77, [Pearl Creek Township], Sept. 30 to Oct. 4, 1874, p. 3.

¹⁴VanAntwerp, Edwin H., Deputy Surveyor, "Field Notes [and accompanying plat] of the Survey of the Subdivisional Lines of Township 112 North, Range 60 West of the 5th Principal Meridian, Dakota Territory," Subdivisions, Dakota: Vol 77, [Liberty Township], Aug. 20 to Aug. 25, 1874, p. 224.

¹⁵VanAntwerp, Edwin H., Deputy Surveyor, "Field Notes [and accompanying plat] of the Survey of the Subdivisional Lines of Township 113 North, Range 59 West of the 5th Principal Meridian, Dakota Territory," Sub-divisions, Dakota: Vol 121, [Barrett Township], Jul. 19 to Jul. 24, 1875, p. 3.

¹⁶Allen, Joseph, Deputy Surveyor, "Field Notes [with accompanying plat] of the Survey of the Subdivisional Lines of Township 113 North, Range 60 West of the 5th Principal Meridian, Dakota Territory," Sub-divisions, Dakota: Vol 122, [Milford Township], Jul. 19 to Jul. 23, 1875, p. 3.

¹⁷Blanding, James C., Deputy Surveyor, "Field Notes [with accompanying plat] of the Survey of the Subdivisional Lines of Township 109 North, Range 62 West of the 5th Principal Meridian, Dakota Territory," Sub-divisions, Dakota: Vol 150, [Grant Township], May 21 to May 24, 1874, p. 5.

¹⁸Mellen, John N., Surveyor, "Field Notes [and accompanying plat] of the Survey of the Subdivisional Lines of Township 113 North, Range 65 West of the 5th Principal Meridian, Dakota Territory," Sub-divisions, Dakota: Vol 169, [Nance Township], Apr. 20 to Apr. 24, 1882, p. 13.

¹⁹U.S., General Land Office, Instructions to the Surveyors General of Public Lands of the United States, for those Surveying Districts Established In and Since the Year 1850; Containing, also, A Manual of Instructions to Regulate Field Operations of Deputy Surveyors, Illustrated with Diagrams, by John M. Moore, Principal Clerk of Surveys (Washington: Government Printing Office, 1855), p. 15.

²⁰"Field Notes [with accompanying plat] of the Survey of the Subdivisional Lines of Township... North, Range... West of the 5th Principal Meridian, Dakota Territory." Sub-divisions, Dakota: Vols. 77, 80, 121, 122, 141, 150, 153, 155, 169, 265, 266, 324. (Handwritten.)

²¹"Field Notes [with accompanying plat] of the Survey of the Subdivisional Lines of Township... North, Range... West of the 5th Principal Meridian, Dakota Territory." Sub-divisions, Dakota: Vols. 77, 80, 121, 122, 141, 150, 153, 155, 169, 265, 266, 324. (Handwritten.)

²²U.S., General Land Office, Instructions to the Surveyors General of Public Lands of the United States, for those Surveying Districts Established In and Since the Year 1850; Containing, also, A Manual of Instructions to Regulate Field Operations of Deputy Surveyors, Illustrated with Diagrams, by John M. Moore, Principal Clerk of Surveys (Washington: Government Printing Office, 1855), p. 2.

²³U.S. Department of the Interior, Bureau of Land Management, A History of the Rectangular Survey System, by C. Albert White, (Washington, D.C.: U.S. Government Printing Office, 1983), page 460.

²⁴*Ibid.*, p. 460.

Chapter III

PHYSICAL FEATURES

3.1 Introduction

Now that the mechanics of land surveying in Beadle County have been explained, the next area of discussion involves the physical features of Beadle County. This part of the paper uses a series of comparisons to identify and explain the data gathered by the original land surveyors. The chapter opens with a comparison of the topographic comments from the original notes to a modern topographic map of the county. Following this is a brief review of the comments from the original notes that concern the water features of the county. The third part of the chapter deals with soil quality. Soil quality in Beadle County is evaluated through the original field notes and by a brief study of a modern soil map. The chapter concludes with a discussion of the timber and grass in the county as vegetation is identified by the original field notes.

3.2 Topographical Comments

Recording information about physical characteristics of the land was an important part of the work done by original land surveyors. The information

collected probably was used by incoming settlers to better know what was to be found in the part of the county that they planned to homestead -- assuming, of course, that the land was surveyed prior to their arrival. The land surveyor was required to comment on the topography, existing water, soil quality, and timber and grass found in the area in which he was working. Each of these four areas were important to the incoming settler. Due to their importance, each was stressed in the instructions sent to the Deputy Surveyors and, as a result, detailed reference to these physical features was consistently found in the original land surveyors notes. The following sections of this paper discuss each of these four areas of interest.

Land surveyors were to comment on the topography of the land that they were surveying. The 1855 Manual states that surveyors were to "present, as far as possible, a full and complete topographical description of the country surveyed, as to every matter of useful information, or [information] likely to gratify public curiosity."¹ This statement in the instructions points out the fact that the surveys were done primarily for use of the settlers, rather than simple government mapping of the areas.

3.3 Original Beadle County Topographical Comments

The 1855 Manual suggests the following comments on the lands surface (topography): level, rolling, broken, or hilly.² These four comments were used by the original surveyors as they commented on the land in Beadle County. In addition to these four classifications, several more were used by the original surveyors in an attempt to better describe the land. The original surveyors made twenty-three different comments concerning topography in Beadle County. These comments are shown in Table 4.

TABLE 4

ORIGINAL SURVEYORS TOPOGRAPHICAL COMMENTS³

Land level	Foothills
Flat prairie	Broken
Level prairie	High & rolling
High prairie	High & broken
Land level & gently rolling	Low & flat
Land gently rolling	Creek bottom
Land undulating	Bottom land
Slightly rolling	Dry drain level
Land rolling	Level & marshy
Rolling prairie	Flat & marshy
Surface rolling	Low & flat
Hilly	

Mapping 23 different categories would have been difficult, time consuming, and the end result would have been difficult to interpret. As a result, the 23 comments have been reduced to five categories, with each category containing related comments. These original

TABLE 5

ORIGINAL SURVEYORS TOPOGRAPHICAL COMMENTS
BROKEN INTO 5 CATEGORIES

Category 1.	Land level Flat prairie Level prairie High prairie
Category 2.	Land level & gently rolling Land gently rolling Land undulating Slightly rolling Land rolling Rolling prairie Surface rolling
Category 3.	Hilly Foothills Broken High & rolling High & broken
Category 4.	Low & flat Creek bottom Bottom land Dry drain level
Category 5.	Level & marshy Flat & marshy Low & wet

comments were categorized by the author, in Table 5, to allow them to be used to create a map of the county.

3.4 Mapping Beadle County Topographical Comments

These five categories were used by the author to map the topography of the Beadle County. This map was created in an attempt to illustrate the use of the comments in the creating a map that represents the land's actual topography as recorded by the original surveyor.

This map is shown as Figure 9. The author chose to use five different categories due to what appear to be natural divisions in the comments made by the original surveyors. Since Beadle County is basically flat to gently rolling terrain (with the exception of the James River valley), mapping the county's topography as recorded by the original surveyor shows very little topographical detail. The intent of the information collected by the original surveyor was not to create a detailed contour map of the township; rather, it was to record a bit of topographical information so that the incoming settler might have an idea of the character of the land.

All five categories were used in a demonstration of the mapping process by the author. A sixth category was used while the data were being gathered from the original field notes. On occasion the surveyor would not comment on the topography of a section, thus the use of 'Category 0 - No Evaluation.' The map presented in Figure 9 uses categories 1 through 5, since the 'Category 0 - No Evaluation' occurred so seldom as not to be applicable to the mapping procedure.

Examination of the map created with the data collected from the surveyors notes (Figure 9) shows that some of the surveyors made a more accurate evaluation of

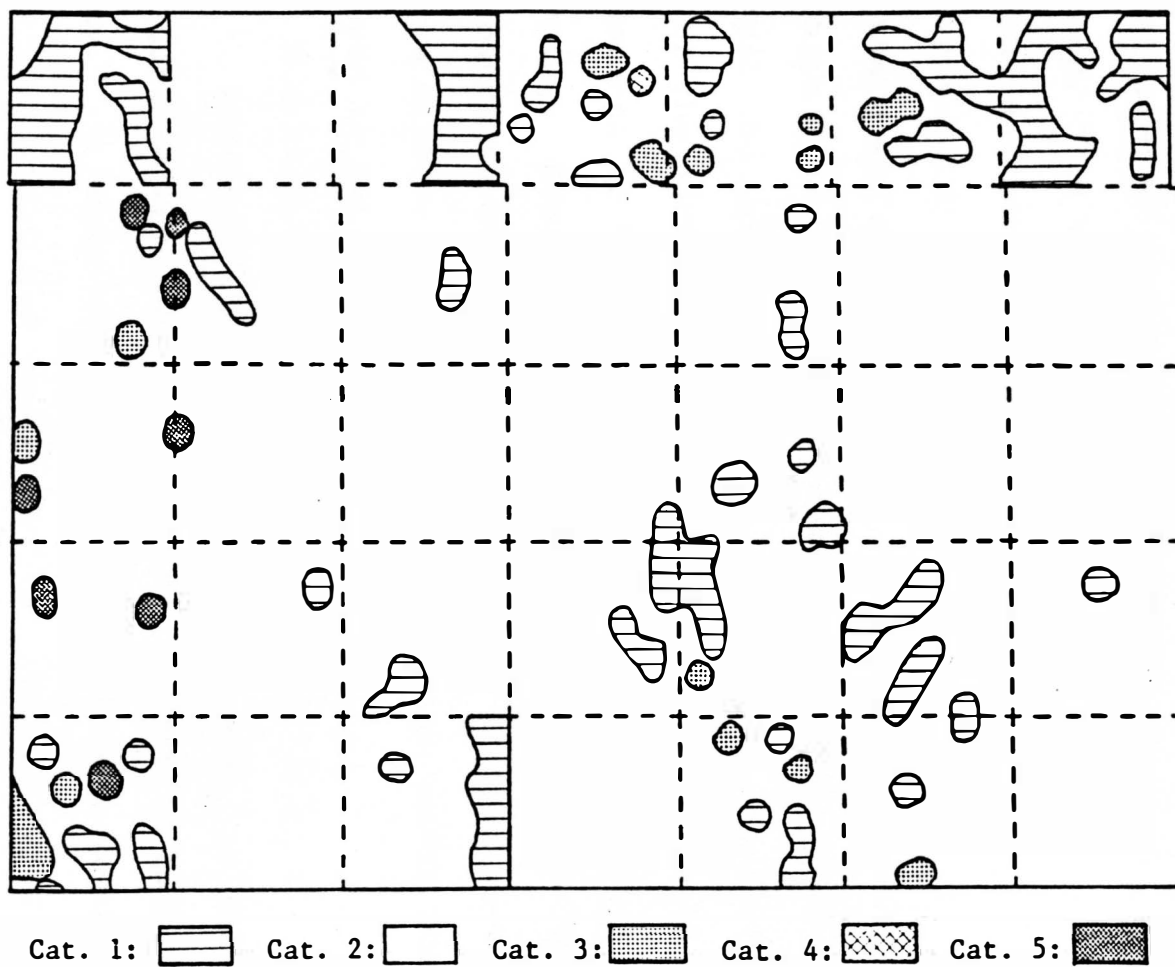


Figure 9. Beadle County Topographic Map from the original land surveyors notes.

the topography -- or at least they did not make the same comment over and over again through the whole township. The townships with a variety of comments generally are in the northern most tier of townships, an area in the south central part of the county, and the southwestern township. The author, upon seeing the difference in apparent accuracy of topographical assessment, went to the map showing who surveyed the county (Figure 7) hoping that there would be some correlation between the townships with a variety of comments and the men who surveyed the land. The implication here is that one or more of the surveyors may have been making more accurate assessments of the topography of the land that they were surveying. However, no valid comparison could be made. The townships with varying assessments of land were made by five different surveyors and the whole county was surveyed by seven surveyors.

3.5 Modern Beadle County Topographical Mapping

For the purpose of comparison, also included here as Figure 10 is a modern topographical map of Beadle County.⁴ A ready comparison of the two maps is not easy, since the modern map is not divided into five separate categories. An overlay for the modern map of the county that was divided into the five categories would be entirely subjective on the part of the author. The point is that the evaluation of land made by the early

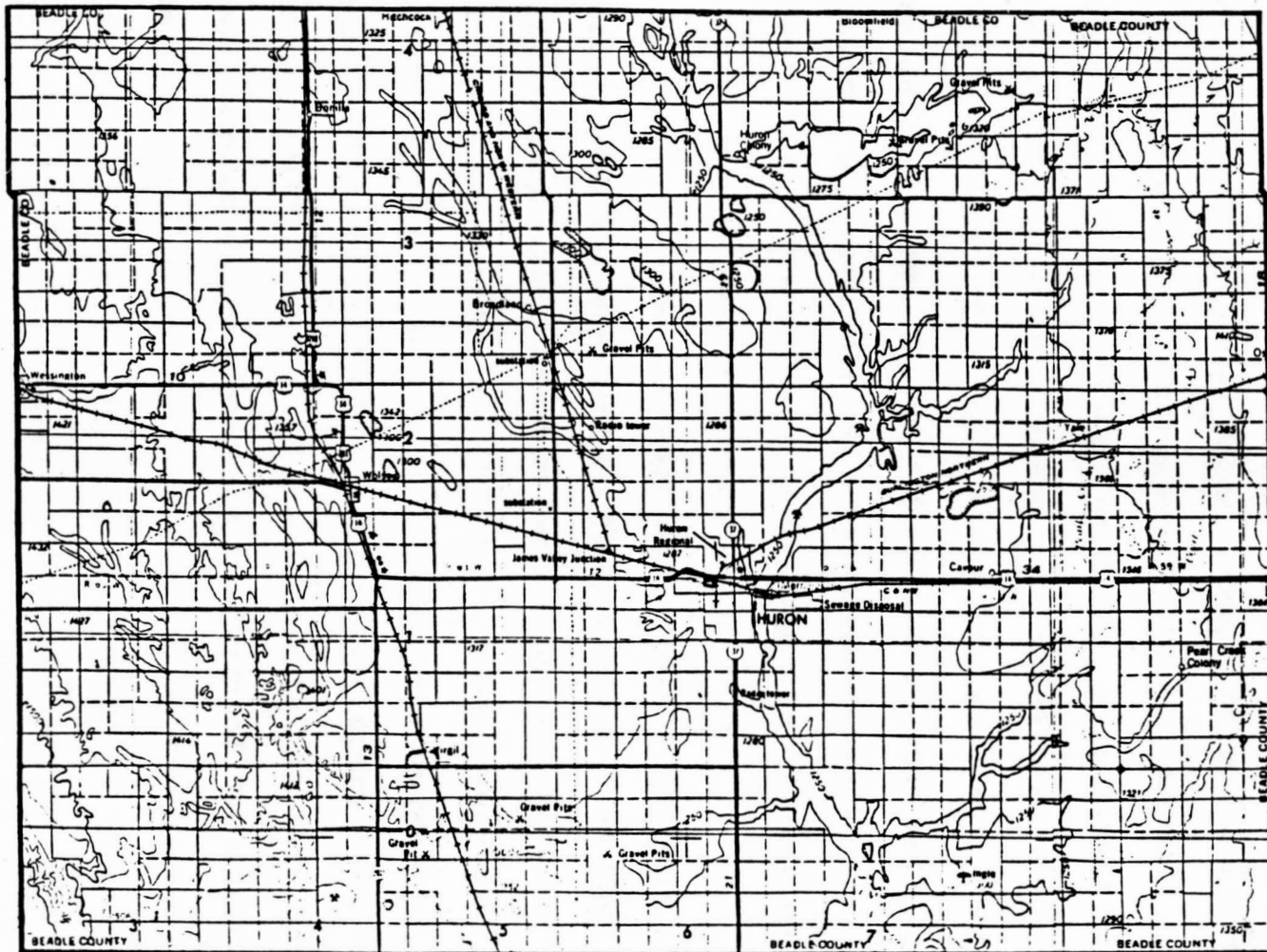


Figure 10. Beadle County Topographic Map from Defense Mapping Agency maps.

surveyors was very subjective. The original instructions stated that the surveyor was to evaluate the topography of the land and record his comment in a certain format at a particular place in the notes. The instructions did not, for example, tell the surveyor the difference between 'rolling' and 'hilly' terrain. As a result, the evaluation of topography became very subjective on the part of each surveyor. Land surveyors were not geographers, geologists, or topographical engineers. They simply were men who had enough education in mathematics to be able to pass an exam that qualified them to be Deputy Land Surveyors.

Surveyors did the best they could with the resources they had available. They realized, as they were surveying, that the four topography identifiers -- level, rolling, broken, and hilly -- simply were not enough to identify the land that they were surveying. As a result, they added several other identifiers (listed in Table 4). Different surveyors must certainly have had a mental image of what they perceived each of the different classifications of land were to depict on the ground. It was an oversight on the part of the writer of the instructions that the comments on topography were not defined. Had they been defined, a more consistent program of topographic identification would have been produced.

As was discussed earlier in this chapter, the major factor responsible for topographic relief in Beadle County is the James River. This introduces the next area of discussion: water, and its recording in the original surveying notes.

3.6 Comments on Water from the Original Instructions

According to the 1855 Manual, the original surveyors were to record "intersections by line of water objects. All rivers, creeks, and smaller streams of water which the line crosses; the distance on the line at the points of intersection, and their widths on line." Also to be described were "springs of water -- whether fresh, saline, or mineral, with the course of the stream flowing from them." Also "lakes and ponds -- describing their banks and giving height, and also the depth of water, and whether it be pure or stagnant."⁵

3.7 Water in Beadle County

An evaluation of all the water present in Beadle County at the date of the original survey would be a tedious task requiring a line-by-line review of the original notes looking for any comment relating to water. This form of evaluation was not done by the author. The author chose instead to review the "General Description" comments that follow the notes for each of the townships in search of the required comment about water.

In Beadle County water was found in swamps, sloughs, Lake Byron, the James (sometimes called Dakota) River, and in an abundance of smaller streams and creeks. Typical comments about water found in the general descriptions are:

From Burr Oak Township -- "the eastern portion (of the township) lays extremely⁶ nice with good soil and very well watered."

From Sand Creek Township -- "most of the marshes and swamps go dry."⁷

From Whiteside Township -- "The creek in the S.W. part of the township is liable to dry up."⁸

From Nance Township -- "the creek in the northwest portion is a fine stream of pure water."⁹

From Carlyle Township - "We dug a well, ten rods west of corner sec. 27, 28, 33, & 34, ^{six} feet deep and got two feet of good water."¹⁰

From Allen Township - "There is a pond of water in the southeast corner of section 6. The water is soft and good for drinking. Water can also be obtained by digging from fifteen to twenty feet."¹¹

These last two comments are of some concern to the author. Both refer to the depth at which water may be found under the prairie soil. It may be that the surveyors did dig (on occasion) for water on the prairies of Dakota as is stated in the example from Carlyle Township. However, does it seem reasonable that they would dig a hole in prairie soil "fifteen to twenty feet" deep in search of water? A settler would, but more than likely a surveyor would not. Since there were only two

recorded settlers in the county at the time of the survey, it is very likely that the surveyors were making an educated guess (read 'shot in the dark') concerning the depth of available water.

In addition to making written comments about water in the county, surveyors also mapped the water in the townships. Figures 11 and 12 are reproductions of two plats from Beadle County. The two figures show water features found in Beadle County at the time of the original surveys.

These maps were created using the notes that surveyors wrote as they ran the line. The maps were drawn when surveying crews were back in from the field. The maps may have been drawn up by some other individual whose sole responsibility was to draw maps of townships as the field notes came back to the main office from field crews. In either case, the maps created were fairly accurate, since they were drafted directly from information collected in the field. These maps are called plats. A plat is available for every township in Beadle County, indeed from every township in the state of South Dakota.

Water was an important part of the prairie, but the prairie soil itself was of foremost importance. Soil and soil quality are the topics of discussion in the following section.

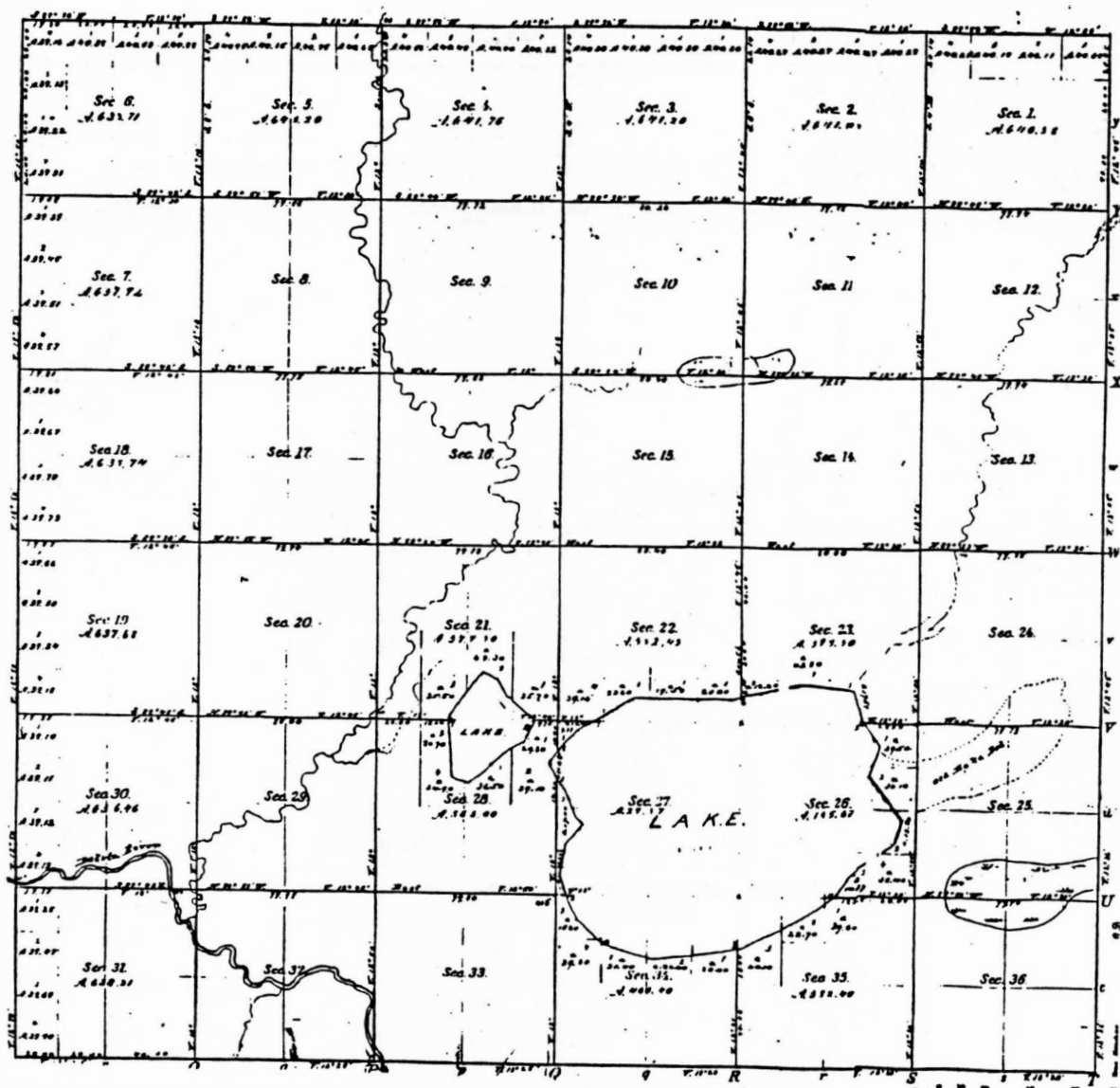


Figure 11. This figure is reproduced from the original plat for Lake Byron Township (T.113N., R.61W. of the 5th P.M.). This plat shows Lake Byron, the Dakota (James) River, and two unnamed streams - all water features of Beadle County.

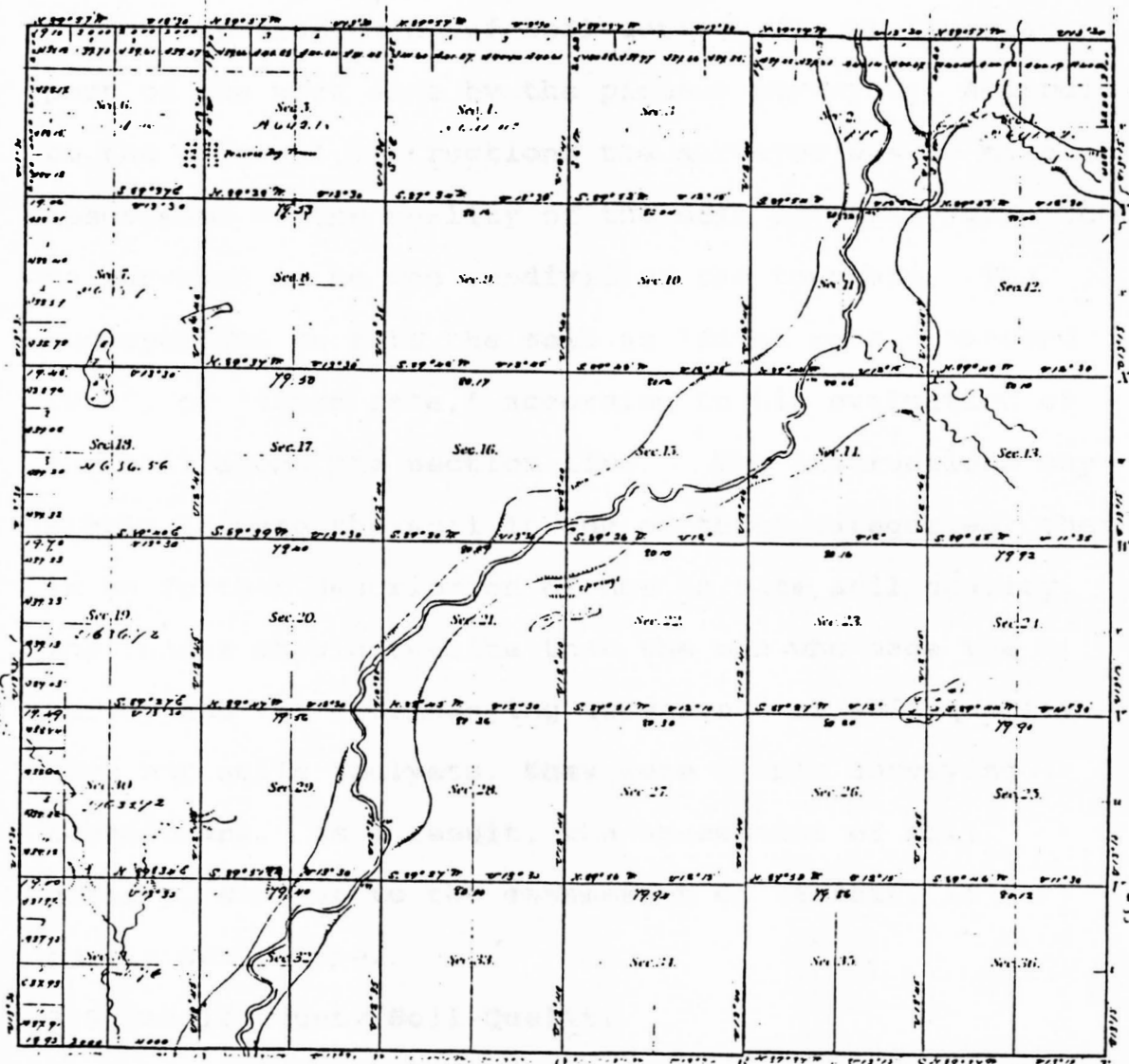


Figure 12. This figure is reproduced from the original plat for Valley Township (T.111N., R.61W. of the 5th P.M.). This plat shows the Dakota (James) River and several streams - all water features of Beadle County.¹³

3.8 Required Comments on Soil Quality

An assessment of soil quality was an important part of the work done by the pioneer surveyor. According to the original instructions the surveyor was to make an assessment of the quality of the soil for every mile that he surveyed as he was subdividing the township. The surveyor was to rate the soil as 'first rate,' 'second rate', or 'third rate,' according to his evaluation of the soil along the section line. The instructions say simply to rate the soil in one of three categories; there is no further description of how to rate soil quality. The reader should realize that the men who made the survey and the accompanying assessment of soil quality were not soils analysts, they were simply surveying technicians. As a result, the assessment of soil quality, similar to the assessment of terrain, is a purely subjective.

3.9 Beadle County Soil Quality

The author has mapped Beadle County to show the soils assessment as made by original surveyors. Figure 13 shows the three different soil qualities. The author has chosen to show the generalized map of the three soil types. This map shows the subjective nature of soil assessment. Deputy Surveyors Blanding and Allen rated most of the soil in those townships which they surveyed as being second rate, whereas the other surveyors

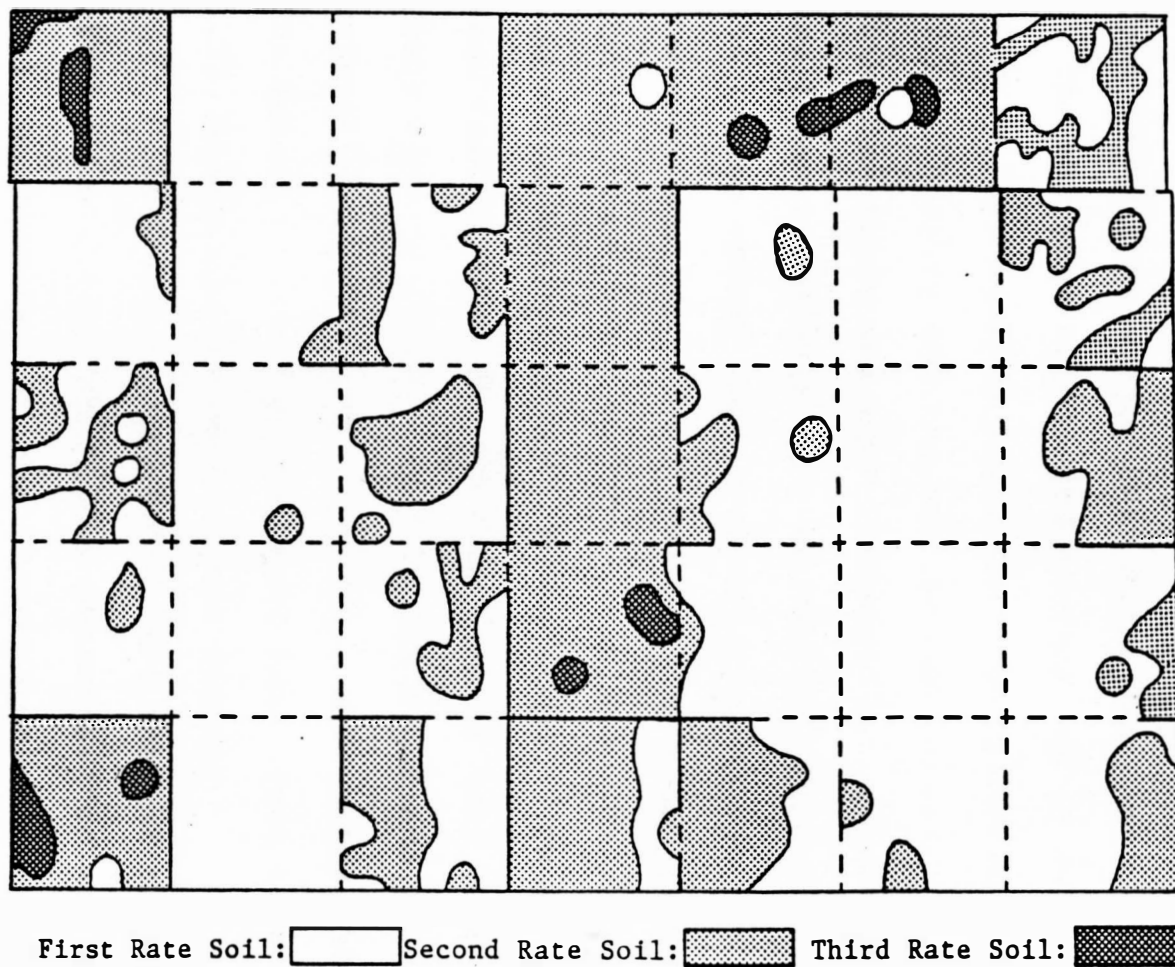


Figure 13. Beadle County Soils Map from the original land surveyors notes.

considered soil in the areas that they surveyed to be first rate.

3.10 Original Surveyors Comments on Soil Quality

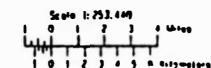
As was the case with the assessment of topography, the author went from the completed soils map to the map showing who had surveyed which townships (Figure 10), looking for a correlation between assessment of soil quality and the man who had done the survey. This time there was some correlation. As noted, Blanding and Allen rated most soil as second rate. This was also the rating chosen most frequently by Wolley and Mellen; however, the latter two surveyors only surveyed one township each. Deputy Surveyors Bates, VanAntwerp, and Greene surveyed the rest of the county. These men showed some variation in their assessment of soil quality. Their assessments were all in the first and second rate categories. Though this is not a wide range, it allowed the author to map the different soil types as evaluated.

3.11 Modern Beadle County Soil Quality

Included in Figure 14 is a copy of the map created by the United States Department of Agriculture, Soil Conservation Service in cooperation with the South Dakota Agricultural Experimentation Station. The data used to compile this map were gathered in 1979.¹⁴ The maps in Figures 13 and 14 show no similarities when compared. This is due primarily to the different systems

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
SOUTH DAKOTA AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP BEADLE COUNTY, SOUTH DAKOTA



SOIL LEGEND*

SOMEWHAT POORLY DRAINED TO EXCESSIVELY DRAINED
SOILS FORMED MAINLY IN GLACIAL TILL AND GLACIAL
DRIFT

- 1 Beadon: Deep, well drained, nearly level to gently rolling loamy soils formed in glacial till on uplands
- 2 Beadon-Dudley: Deep, well drained, nearly level to undulating loamy soils and deep, moderately well drained, nearly level soils that have a clayey subsoil; all formed in glacial till on uplands
- 3 Beadon-Ethan: Deep, excessively drained and well drained, gently rolling to steep loamy soils formed in glacial till on uplands
- 4 Beadon-Lane: Deep, excessively drained, gently rolling to steep loamy soils formed in glacial till on uplands and deep, somewhat poorly drained, nearly level silty soils formed in alluvium on bottom land
- 5 Beadon-Sanilac: Deep, well drained and moderately well drained, nearly level to gently rolling loamy soils formed in glacial drift on uplands
- 6 Beadon-Princeton-Dudley: Deep, well drained and moderately well drained, nearly level to undulating loamy soils and deep, moderately well drained, nearly level to undulating soils that have a clayey subsoil; all formed in glacial till on uplands
- 7 Beadon-Princeton: Deep, well drained and moderately well drained, nearly level to gently rolling loamy soils formed in glacial till on uplands

MODERATELY WELL DRAINED AND WELL DRAINED SOILS
FORMED IN GLACIAL OUTWASH AND GLACIAL DRIFT

- 8 Carleton-Hard: Deep, moderately well drained and well drained, nearly level to gently rolling loamy soils formed in glacial outwash and glacial drift on uplands
- 9 Carleton-Eric: Deep, moderately well drained and well drained, nearly level to undulating loamy soils formed in glacial outwash on uplands and upland terraces

MODERATELY WELL DRAINED SOILS FORMED IN
ALLUVIUM

- 10 Larr: Deep, moderately well drained, nearly level silty soils formed in alluvium on upland flats, alluvial fans, and terraces
- 11 Laddell-Leno-Midridge: Deep, moderately well drained, nearly level silty soils formed in alluvium on bottom land and low terraces

*Texture limits in these descriptive headings are for the surface layer of the major soils in each map unit.

Compiled 1973

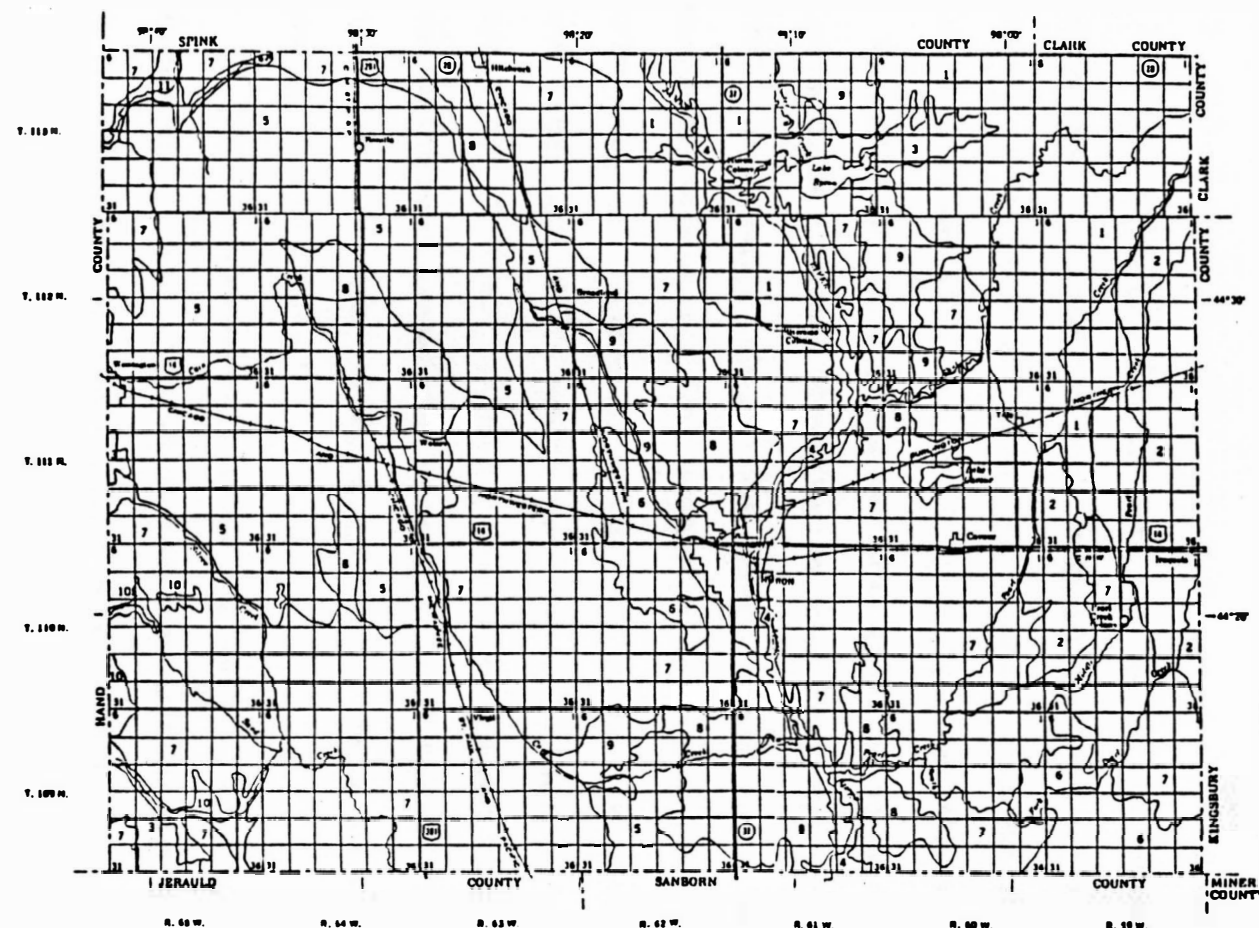


Figure 14. General Soils Map of Beadle County from the United States Department of Agriculture.

used to analyze and classify the soils. Early surveyors used a simple visual evaluation, while the modern soils analyst uses a thorough scientific analysis. The 1979 map shows three broad soil groups consisting of eleven different soil kinds (types) while the data from the original soil surveys show only three different soil qualities.

3.12 Original Surveyors Comments on Soil and Gravel

In addition to the map of three different soil categories, the author also mapped another of the comments made by the surveyors. This comment also is concerned with soil and soil quality. As the surveyor was making his evaluation of the soil in each section, he often made a related comment on the presence of sand, gravel, or other rock in the soil. This is a fairly easy comment to map since the observations were scattered and fairly easy to define to a limited area. Figure 15 shows these data, based on comments: 'sand,' 'sandy,' 'gravel,' 'gravelly,' 'rock,' 'stony,' and 'scattered boulders.'¹⁵ These different comments were put into three different categories for ease of mapping. The three categories are shown in Table 6.

These comments, though valuable for the incoming homesteader, were of little use in making comparisons with a modern soils map of the same area. One comment found in the original surveying notes may have been of

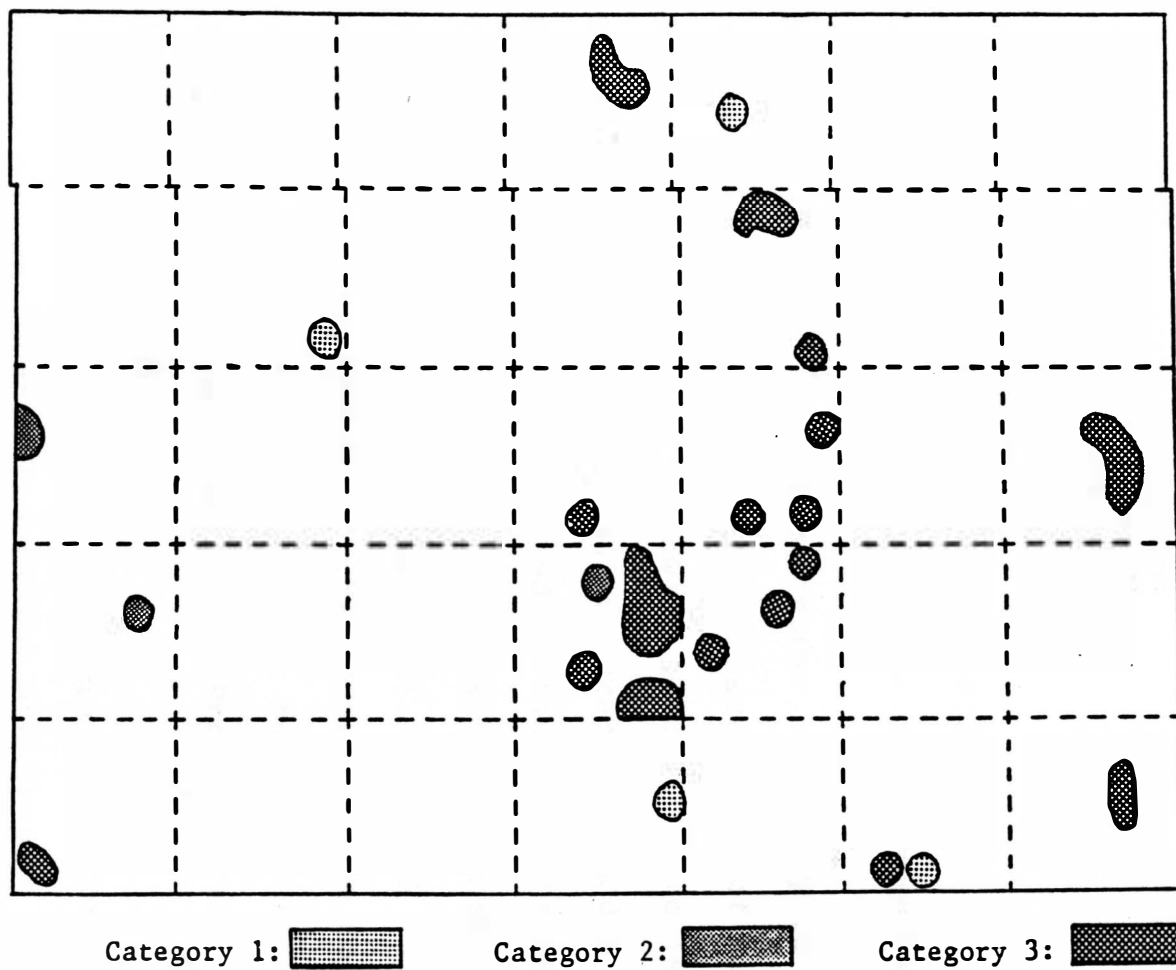


Figure 15. Soils Overlay for Beadle County from the original land surveyors notes.

TABLE 6

CATEGORIES FOR SOILS OVERLAY

Category 1.	Sand Sandy
Category 2.	Gravel Gravelly
Category 3.	Rock Stony Scattered boulders

particular interest to a homesteader, but only if he were a stone mason. From the general description of Pleasant View Township comes the following note: "There is an immense quantity of sandstone and granite boulder outcropping out on the elevated portions of the prairie affording excellent building material."¹⁶ As stated, this may have been valuable material, but only if the individual who had access to the stone had the tools and the knowledge to use the stone as a building material.

3.13 Comments on Timber and Grass Required from the Original Instructions

Another of the comments required by the early surveyor was one concerning timber and grass. According to the 1855 Manual the surveyor was to comment on "the several kinds of timber and undergrowth, in the order in which they predominate."¹⁷ Generally, the surveyor commented about vegetation only in the general

description written about the township. In some unusual cases, however, he might comment in the middle of the notes along the line he was running. In order to get a comment along the line, the circumstances would have to be unusual. For example, the prairie grass might have been tall enough to prevent the men from seeing each other as they ran the line. Another example might be trees or a thicket directly on the line. This thick underbrush might cause quite a delay as the crew chopped their way through the brush to run the line. Fire was a common hazard on the dry prairie, and a prairie fire might interrupt the crew. Worse yet, a fire might burn the support wagon and supplies or burn the surveyors' instruments and field notes.

A comment about grass quality in the surveying notes was very important to the new settler. Often his only contact with the land that he was planning to homestead would be through the comments written by the surveyor as he ran the line. Grass on the land that the settler was planning to make into a home was very important since it would probably be the basis for his first home - a sod house. Also, of course, grass is important for any livestock that the new settler might have brought to the homestead. In the event that a reliable source of fuel was not available to heat the house during winter months, tall prairie grass could be

twisted into tight bundles and used as a source of heating and cooking fuel.

Timber was as important to the new settler as was grass. Timber furnished material to frame doors, windows, and the roof of the new sod house, as well as furnishing material for a corral. In addition, a stand of trees furnished a source of fuel to warm the new 'soddy' during the long, cold winter months.

3.14 Timber and Grass in Beadle County

Examples of comments concerning timber and grass found in Beadle County follow.

From Carlyle Township -- "No timber."¹⁸

From Hartland Township -- "Good grass in the vallies (sic)."¹⁹

From Altoona Township -- "and growth of grass is heavy. . . No timber."²⁰

From Pleasant View Township -- "A few scattering (sic) trees of ash, willow and cottonwood are found along both banks of the river."²¹

From Lake Byron Township -- "There is considerable timber along the banks of the lake, ash, willow, and cottonwood."²²

From Richland Township -- "No timber found. Grass is mostly buffalo grass."²³

From Milford Township -- "The grass is short bunch grass very stunted and dry."²⁴

Timber and grass on the prairie were important to incoming settlers. Even more important were the location of towns and a railroad. A

prairie town with rail service provided the settler with a link to the rest of the world. The location of settlements, settlers homesteads, railroads, and wagon roads were all recorded by the surveyor. The next chapter details these cultural improvements on the prairie, as well as the general description written about each township.

CHAPTER III END NOTES

¹U.S., General Land Office, Instructions to the Surveyors General of Public Lands of the United States, for those Surveying Districts Established In and Since the Year 1850; Containing, also, A Manual of Instructions to Regulate Field Operations of Deputy Surveyors, Illustrated with Diagrams, by John M. Moore, Principal Clerk of Surveys (Washington: Government Printing Office, 1855), p. 15.

²Ibid., p. 17.

³"Field Notes [with accompanying plat] of the Survey of the Subdivisional Lines of Township ... North, Range ... West of the 5th Principal Meridian, Dakota Territory." Sub-divisions, Dakota: Vols. 77, 80, 121, 122, 141, 150, 155, 169, 265, 266, 324. (Handwritten.)

⁴U.S., Geological Survey, Huron, Western United States, 1:250,000, and Watertown, Western United States, 1:250,000, Defense Mapping Agency, map no. (Huron) NL 14-11, and (Watertown) NL 14-12 (Denver, CO: U.S. Geological Survey, (Huron) 1976 and (Watertown) 1981).

⁵U.S., General Land Office, Instructions to the Surveyors General of Public Lands of the United States, for those Surveying Districts Established In and Since the Year 1850; Containing, also, A Manual of Instructions to Regulate Field Operations of Deputy Surveyors, Illustrated with Diagrams, by John M. Moore, Principal Clerk of Surveys (Washington: Government Printing Office, 1855), p. 17.

⁶Wooley, Miles T., Deputy Surveyor, "Field Notes [and accompanying plat] of the Survey of the Subdivisional Lines of Township 109 North, Range 65 West of the 5th Principal Meridian, Dakota Territory," Sub-divisions, Dakota: Vol. 324, [Burr Oak Township], Oct. 18 to Nov. 7, 1881, p. 103.

⁷Bates, Charles H., Deputy Surveyor, "Field Notes [with accompanying plat] of the Survey of the Subdivisional Lines of Township 110 North, Range 65 West of the 5th Principal Meridian, Dakota Territory," Sub-divisions, Dakota: Vol. 324, [Sand Creek Township], Aug. 23 to Aug. 28, 1881, p. 172.

⁸Bates, Charles H., Deputy Surveyor, "Field Notes [with accompanying plat] of the Survey of the Subdivisional Lines of Township 112 North, Range 65 West of the 5th Principal Meridian, Dakota Territory," Sub-divisions, Dakota: Vol. 324, [Whiteside Township], Sept. 30 to Oct. 6, 1881, p. 325.

⁹Mellen, John N., Surveyor, "Field Notes [and accompanying plat] of the Survey of the Subdivisional Lines of Township 113 North, Range 65 West of the 5th Principal Meridian, Dakota Territory," Sub-divisions, Dakota: Vol. 169, [Nance Township], Apr. 20 to Apr. 24, 1882, p. 63.

¹⁰Blanding, James C., Deputy Surveyor, "Field Notes [with accompanying plat] of the Survey of the Subdivisional Lines of Township 109 North, Range 63 West of the 5th Principal Meridian, Dakota Territory," Sub-divisions, Dakota: Vol. 153, [Carlyle Township], May 16 to May 20, 1874, p. 63.

¹¹VanAntwerp, Edwin H., Deputy Surveyor, "Field Notes [and accompanying plat] of the Survey of the Subdivisional Lines of Township 112 North, Range 64 West of the 5th Principal Meridian, Dakota Territory," Sub-divisions, Dakota: Vol. 266, [Allen Township], Aug. 14 to Aug. 18, 1877, p. 183.

¹²Allen, Joseph, Deputy Surveyor, "Field Notes [with accompanying plat] of the Survey of the Subdivisional Lines of Township 113 North, Range 61 West of the 5th Principal Meridian, Dakota Territory," Sub-divisions, Dakota: Vol. 122, [Lake Byron Township], Aug. 4 to Aug. 9, 1875, from the plat.

¹³VanAntwerp, Edwin H., Deputy Surveyor, "Field Notes [and accompanying plat] of the Survey of the Subdivisional Lines of Township 111 North, Range 61 West of the 5th Principal Meridian, Dakota Territory," Sub-divisions, Dakota: Vol. 80, [Valley Township], Aug. 6 to Aug. 11, 1874, from the plat.

¹⁴U.S. Department of Agriculture, Soil Survey of Beadle County, South Dakota, Soil Conservation Service in cooperation with South Dakota Agricultural Experimentation Station, by Dennis M. Heil (Washington, D.C.: U.S. Government Printing Office, 1979) pp. 1-9.

¹⁵"Field Notes [with accompanying plat] of the Survey of the Subdivisional Lines of Township ... North, Range ... West of the 5th Principal Meridian, Dakota Territory." Sub-divisions, Dakota: Vols. 77, 80, 121, 122, 141, 150, 155, 169, 265, 266, 324. (Handwritten.)

¹⁶Allen, Joseph, Deputy Surveyor, "Field Notes [with accompanying plat] of the Survey of the Subdivisional Lines of Township 113 North, Range 62 West of the 5th Principal Meridian, Dakota Territory," Sub-divisions, Dakota: Vol. 122, [Pleasant View Township], Aug. 10 to Aug. 14, 1875, pp. 201-202.

¹⁷U.S., General Land Office, Instructions to the Surveyors General of Public Lands of the United States, for those Surveying Districts Established In and Since the Year 1850; Containing, also, A Manual of Instructions to Regulate Field Operations of Deputy Surveyors, Illustrated with Diagrams, by John M. Moore, Principal Clerk of Surveys (Washington: Government Printing Office, 1855), p. 17.

¹⁸Blanding, James C., Deputy Surveyor, "Field Notes [with accompanying plat] of the Survey of the Subdivisional Lines of Township 109 North, Range 63 West of the 5th Principal Meridian, Dakota Territory," Sub-divisions, Dakota: Vol. 153, [Carlyle Township], May 16 to May 20, 1874, p. 63.

¹⁹Greene, Herman C., Surveyor, "Field Notes [with accompanying plat] of the Survey of the Subdivisional Lines of Township 111 North, Range 63 West of the 5th Principal Meridian, Dakota Territory," Sub-divisions, Dakota: Vol. 153, [Hartland Township], Aug. 9 to Aug. 12, 1874, p. 202.

²⁰VanAntwerp, Edwin H., Deputy Surveyor, "Field Notes [and accompanying plat] of the Survey of the Subdivisional Lines of Township 113 North, Range 63 West of the 5th Principal Meridian, Dakota Territory," Sub-divisions, Dakota: Vol. 265, [Altoona Township], Aug. 25 to Aug. 28, 1877, p. 61.

²¹Allen, Joseph, Deputy Surveyor, "Field Notes [with accompanying plat] of the Survey of the Subdivisional Lines of Township 113 North, Range 62 West of the 5th Principal Meridian, Dakota Territory," Sub-divisions, Dakota: Vol. 122, [Pleasant View Township], Aug. 10 to Aug. 14, 1875, pp. 201-202.

²²Allen, Joseph, Deputy Surveyor, "Field Notes [with accompanying plat] of the Survey of the Subdivisional Lines of Township 113 North, Range 61 West of the 5th Principal Meridian, Dakota Territory," Sub-divisions, Dakota: Vol. 122, [Lake Byron Township], Aug. 4 to Aug. 9, 1875, p. 133.

²³VanAntwerp, Edwin H., Deputy Surveyor, "Field Notes [and accompanying plat] of the Survey of the Subdivisional Lines of Township 110 North, Range 60 West of the 5th Principal Meridian, Dakota Territory," Sub-divisions, Dakota: Vol. 77, [Richland Township], Sept. 25 to Sept. 29, 1874, p. 132.

²⁴Allen, Joseph, Deputy Surveyor, "Field Notes [with accompanying plat] of the Survey of the Subdivisional Lines of Township 113 North, Range 60 West of the 5th Principal Meridian, Dakota Territory," Sub-divisions, Dakota: Vol. 122, [Milford Township], Jul. 19 to Jul. 23, 1875, p. 62.

CHAPTER IV

CULTURAL IMPROVEMENTS and GENERAL DESCRIPTION

4.1 Introduction

This chapter opens with a discussion of the cultural improvements that were found in Beadle County at the time of the original surveys. This discussion, interesting as it may be, is rather brief. This is due to the fact that there were only three comments concerning cultural improvements for all of Beadle County. The chapter concludes with an exploration of the general description that was written for each township in the county. These general descriptions, though they were generally only one paragraph in length, contain a great deal of information about the township. This description may be used to gain a quick, overall picture of the township.

4.2 The 1855 Manual on Cultural Improvements

During the time when original land surveys were done in Dakota Territory, there were few cultural improvements on the prairie. Even so, the original surveyors were to record "the distance at which the line first intersects and then leaves every settler's claim and improvement." Also they were to record when the line

crossed "towns and villages; Indian towns and wigwams; houses or cabins; fields, or other improvements; sugar tree groves, sugar camps, mill seats, forges, and factories."¹

4.3 Cultural Improvements in Beadle County

At the time of the original surveys, few comments could be made about cultural improvements in Beadle County simply because only several such improvements existed in the county. The cultural improvements found in the original survey notes for Beadle County are:

From Burr Oak Township -- "Chas. Williams lives in the S. part of sect. 29. House stable sheds & ets (sic) on the S.E. (quarter) of S.W. (quarter) & his field in S.E. (quarter) of S.E. (quarter) of sect. 29."²

* Note: The word 'quarter' in parenthesis is used here by the author since the use of a mathematical symbol as used in the original notes is not possible. The author has tried to reprint the comments here as closely as the use of a typewriter will allow.

From Wessington Township -- "The Chicago and Northwestern Railroad passes through the north part of the township and has a siding and station house in section 6 about 4 ch. S.E. of the township corner.³ Chas. Wheelock has a claim in section 6."³

From Whiteside Township -- "David Richard's claim is located in the S.W (quarter) section 31, on which he has a large, one and one half story house located about one chain N.E. of the Tp. corner. He also has a barn and about 3 acres of breaking."⁴

These three comments are all from the General Descriptions found at the end of the township notes.

Wessington Township is in the western part of the county. Since this township was one of the later ones to be subdivided, it is the only one in the county to show the railroad on the original survey notes. The western row of townships was surveyed into sections in 1881 and 1882, while the rest of the county was surveyed into sections in 1877 or earlier (refer to Figure 7.)

4.4 Cultural Improvements on Beadle County Plats

Cultural improvements appear not only in the general descriptions of the townships, they also appear on the township plats. Figures 16, 17 and 18 are reproductions of the original plats showing the three cultural improvements listed in the respective townships.

4.5 The General Description Required from the 1855 Manual

Upon completion of the survey, the surveyor was required to write a general description of the township. In this description the surveyor was required to comment on several items previously described in this paper. Surveyors were required to comment on the general surface of the township, as well as its soil, geological features, timber, minerals, waters, and other things as applicable.

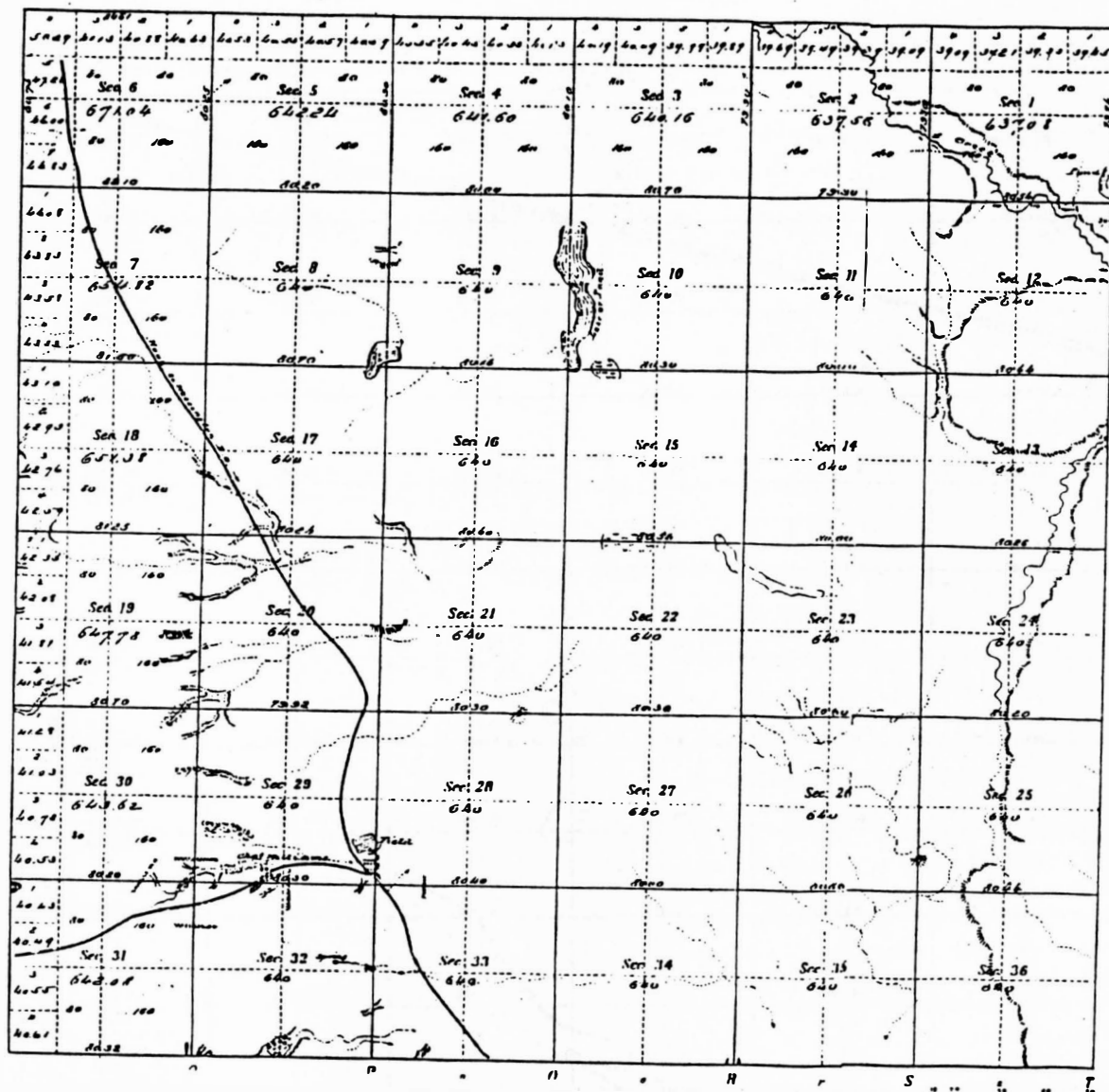


Figure 16. This figure is reproduced from the original plat for Burr Oak Township (T.109N., R.65W. of the 5th P.M.). The plat shows the homestead belonging to Chas. Williams, his fields, and the "Road to Wessington P.O." These are cultural features of Beadle County.

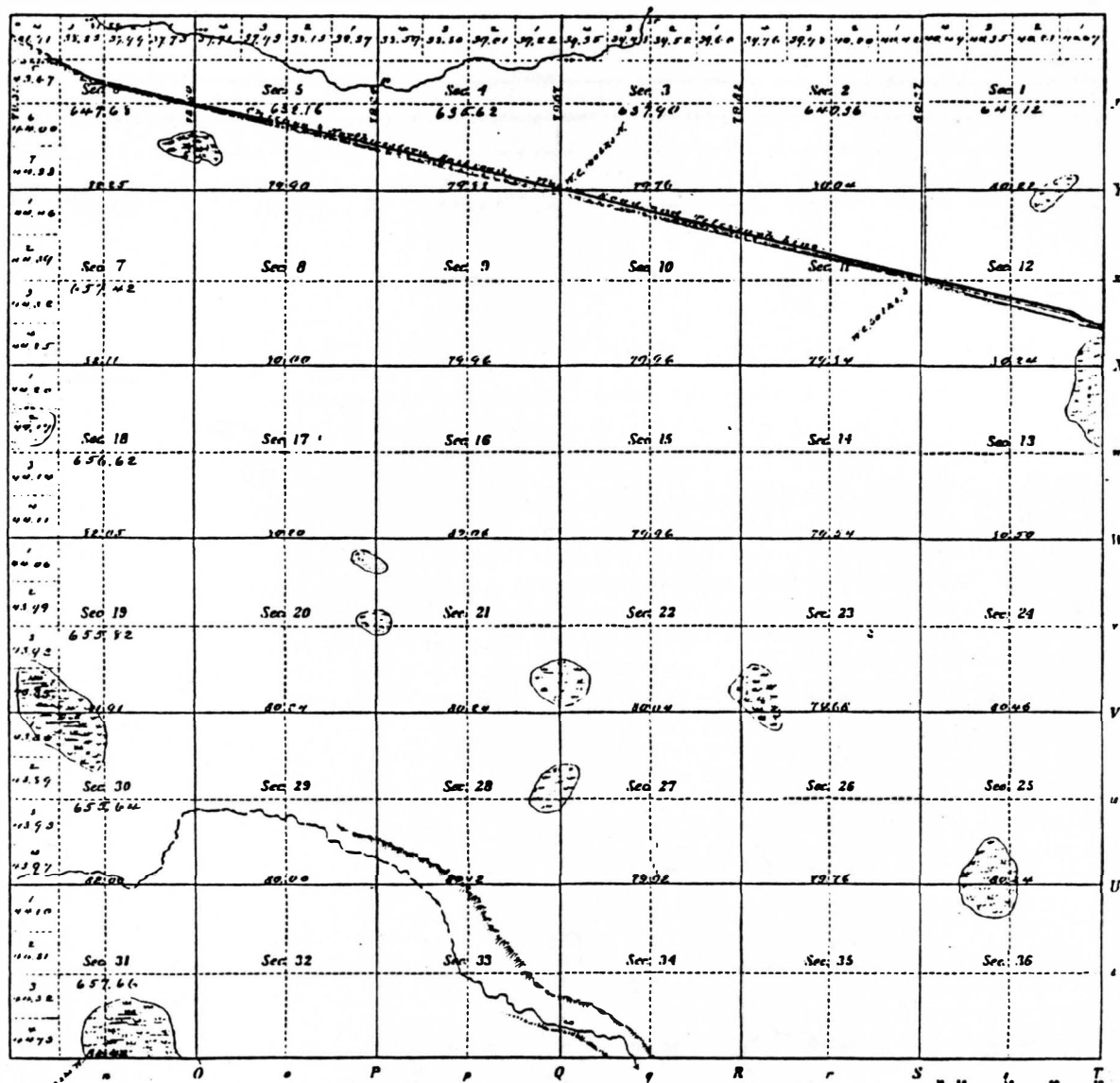


Figure 17. This figure is reproduced from the original plat for Wessington Township (T.111N., R.65W. of the 5th P.M.). The plat shows the railroad and telegraph lines belonging to the Chicago & Northwestern Railroad as they pass through the township. These are cultural features of Beadle County.

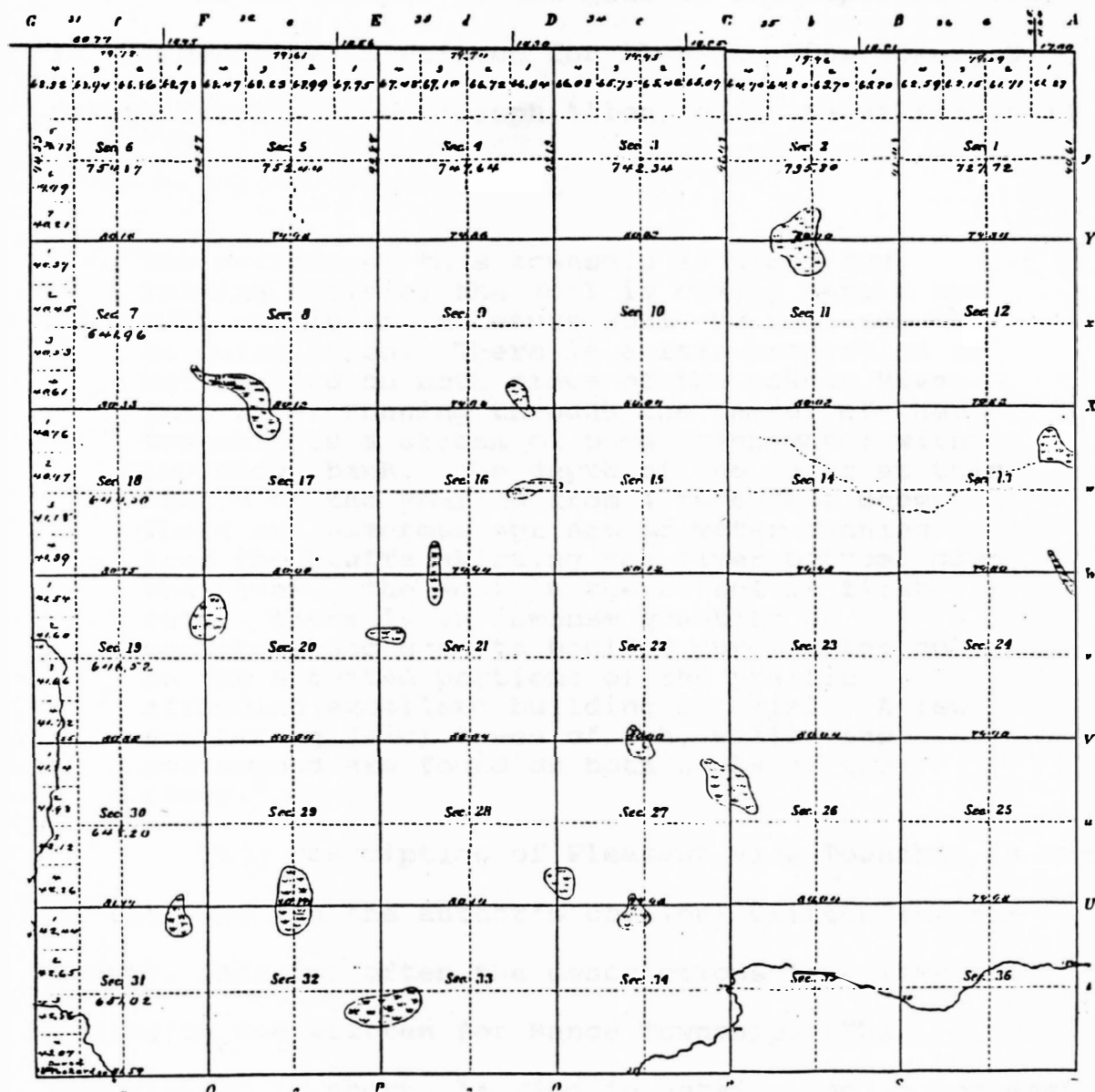


Figure 18. This figure is reproduced from the original plat for Whiteside Township (T.112N., R.65W. of the 5th P.M.). The plat shows (in the lower left corner) the homestead belonging to David Richard. This is a cultural feature of Beadle County.

4.6 General Description of Beadle County Townships

As an example of the general descriptions, here is the description written for Pleasant View Township, Dakota Territory, by Joseph Allen, on or about August 14, 1875.

The surface of this township is high, dry, rolling prairie, the soil is clayey nature and with sufficient moisture would be well adapted to cultivation. There is a fair proportion of bottom land on both sides of the Dakota River. This river running through the center of the township is a stream of pure fresh water with low muddy bank. The depth of the water at this season of the year is from 4 to 6 feet deep. There are numerous springs of water running from the bluffs skirting the river bottom, down the river. The soil in the bottom is first rate. There is an immense quantity of sandstone and granite boulder outcropping out on the elevated portions of the prairie affording excellent building material. A few scattering (sic) trees of ash, willow and cottonwood are found on both banks of the river.

This description of Pleasant View Township is one of the best (in the author's opinion) written for the county. All too often the descriptions look like the following one written for Nance Township. The description is short, lacking in detail, and is not easy to read. The (?)'s indicate words in the description that the author could not decipher. This description is from the original field notes from Nance Township, Dakota Territory (now in Beadle County, South Dakota.) The description was written by John N. Mellen, on or about April 24, 1882.

Nearly the whole of this township is excellent farming land: the soil is a rich gravelly loam. The creek in the northwest portion is a fine stream of pure water and (?) (?) furnish water the (?) (?) (?). The surface is nearly all level prairie; (?) gently rolling in places.

This second description, though it still paints a fairly accurate picture of the township, is not as detailed as the first example shown. Though both descriptions contain most of the required information, the first certainly gave the incoming settler a much better idea of the physical characteristics of the area into which he was planning to move.

CHAPTER IV END NOTES

¹U.S., General Land Office, Instructions to the Surveyors General of Public Lands of the United States, for those Surveying Districts Established In and Since the Year 1850; Containing, also, A Manual of Instructions to Regulate Field Operations of Deputy Surveyors, Illustrated with Diagrams, by John M. Moore, Principal Clerk of Surveys (Washington: Government Printing Office, 1855), p. 17.

²Wooley, Miles T., Deputy Surveyor, "Field Notes [and accompanying plat] of the Survey of the Subdivisional Lines of Township 109 North, Range 65 West of the 5th Principal Meridian, Dakota Territory," Sub-divisions, Dakota: Vol. 324, [Burr Oak Township], Oct. 18 to Nov. 7, 1881, p. 103.

³Bates, Charles H., Deputy Surveyor, "Field Notes [with accompanying plat] of the Survey of the Subdivisional Lines of Township 111 North, Range 65 West of the 5th Principal Meridian, Dakota Territory," Sub-divisions, Dakota: Vol. 324, [Wessington Township], Sept. 22 to Sept. 28, 1881, p. 246.

⁴Bates, Charles H., Deputy Surveyor, "Field Notes [with accompanying plat] of the Survey of the Subdivisional Lines of Township 112 North, Range 65 West of the 5th Principal Meridian, Dakota Territory," Sub-divisions, Dakota: Vol. 324, [Whiteside Township], Sept. 30 to Oct. 6, 1881, p. 325.

⁵Wooley, Miles T., Deputy Surveyor, "Field Notes [and accompanying plat] of the Survey of the Subdivisional Lines of Township 109 North, Range 65 West of the 5th Principal Meridian, Dakota Territory," Sub-divisions, Dakota: Vol. 324, [Burr Oak Township], Oct. 18 to Nov. 7, 1881, from the plat.

⁶Bates, Charles H., Deputy Surveyor, "Field Notes [with accompanying plat] of the Survey of the Subdivisional Lines of Township 111 North, Range 65 West of the 5th Principal Meridian, Dakota Territory," Sub-divisions, Dakota: Vol. 324, [Wessington Township], Sept. 22 to Sept. 28, 1881, from the plat.

⁷Bates, Charles H., Deputy Surveyor, "Field Notes [with accompanying plat] of the Survey of the Subdivisional Lines of Township 112 North, Range 65 West of the 5th Principal Meridian, Dakota Territory," Sub-divisions, Dakota: Vol. 324, [Whiteside Township], Sept. 30 to Oct. 6, 1881, from the plat.

⁸Allen, Joseph, Deputy Surveyor, "Field Notes [with accompanying plat] of the Survey of the Subdivisional Lines of Township 113 North, Range 62 West of the 5th Principal Meridian, Dakota Territory," Sub-divisions, Dakota: Vol. 122, [Pleasant View Township], Aug. 10 to Aug. 14, 1875, pp. 201-202.

⁹Mellen, John N., Surveyor, "Field Notes [and accompanying plat] of the Survey of the Subdivisional Lines of Township 113 North, Range 65 West of the 5th Principal Meridian, Dakota Territory," Sub-divisions, Dakota: Vol. 169, [Nance Township], Apr. 20 to Apr. 24, 1882, p. 63.

CHAPTER V

CONCLUSIONS

The aim of this study has been to introduce the original land surveyors' notes and plats to the geographical community. As this study indicates, the information available within these notes and plats can be a valuable research aid to the geographer.

The notes and plats contain a great deal of information about the physical characteristics of the areas surveyed. In this particular case, a Beadle County area case study, the notes and plats identify the topography of the James River valley and catch just the easternmost edge of the Wessington Hills. Even though the recorded accuracy of the notes and plats is somewhat crude, there may be enough information available to identify possible changes in the landforms of the county. Water features also are included in the physical features of the county. The notes and plats clearly identify the size and path of all water features in Beadle County. The general path of a stream or river is easily identified through the combined use of notes and plats of the area. Further research could be done to identify changes in the location and size of rivers, lakes,

sloughs, and streams of the area. Identification of water characteristics in the 1870's can be of value in making a comparison with present characteristics, and possibly in predicting future changes. It would be interesting to find the places where the James River has changed its path during the past hundred years, and attempting to project what it might do in the next hundred years.

As stated earlier in this paper, comments concerning soil quality from the original notes and plats are not considered (by the author) to be of much use. Due to the inconsistent manner of soil evaluation, perhaps due to a lack of training on the part of surveyors, soil quality comments offer little information to be used in a modern comparison. The writer hopes that this problem has been corrected in our present day soil survey system.

The final topic of discussion, in the area of physical features, was that of timber and grass. Since comments about timber and grass were mandatory for the original surveyor, a great deal of information exists within the original notes. Since the various types of trees and grasses are relatively easy to identify, the data collected are of value. This is an area where further research could yield valuable information. Native trees and grasses had to be hardy varieties since

they evolved naturally to withstand the Dakota prairie weather. Only further research could identify whether this is indeed so, and if we need to (or can) bring back the original plant varieties. Information recorded in the original field notes concerning grass and timber may not have had that much direct impact on the incoming settler. Since grass was used for feed and shelter (sod for homes) however, its presence may have indirectly influenced settlement patterns. The presence of timber may have influenced settlement patterns more directly since timber was important for both housing and fuel for heat. It was not an objective of this study to look into any of these possible correlations, only to make the geographer aware of the available information and to allow someone else to further research the topic.

The original notes and plats do not produce a great deal of information about cultural improvements in Beadle County in the 1870's. However, the notes and plats certainly record the first settlements and their location in Beadle County. From that point forward, someone else can trace settlement patterns in the county. As an interesting side note, the volumes that record this settlement information -- books that record homestead entries -- are stored in the same part of the South Dakota State Library in Pierre as the original land surveyors notes and plats referenced in this paper.

There is a great deal of information found in the original notes in the area called "General Description." The general description is used in field notes to recap and emphasize information found through the rest of the notes. Beadle County area was surveyed prior to settlement, so the general descriptions of the townships were available for incoming settlers to read before they went to look for land to settle. It would be interesting to see if the general descriptions had any influence on the township to which the settlers moved.

The last, though undoubtedly the most important, use of the original land surveyors' notes and plats is that of survey retracement. When a modern surveyor tries to locate and identify a plot, of land he must first locate and identify the original surveying monuments (this may not be necessary if a legal, tied in, monument is available). As the surveyor begins his search for the monument, he can rely on the original notes to give him information concerning the type of monument to look for, and whether the original monument was 'tied' into any other objects. These 'ties' that the surveyor may use from the original notes to identify the distances between monuments (corners), angles to bearing trees (if used), the magnetic variation at the time of the original survey, and any notes that the original surveyor may have made concerning the topography at the site of the

monument. All of these bits of information are available in the original surveying notes, and have been discussed in this paper.

A great deal of information is available in the original land surveyors' field notes and plats for Beadle County. This information, valuable as it may be, is only of potential use if the researcher is aware of its presence and location. Making this information available has been the purpose of this paper, to make geographers aware of a 'new' source of 'old' information to help in the further study of the places we live.

BIBLIOGRAPHY

- Allen, Joseph, Deputy Surveyor. "Field Notes [with accompanying plat] of the Survey of the Subdivisional Lines of Township 113 North, Range 60 West of the 5th Principal Meridian, Dakota Territory." Sub-divisions, Dakota: Vol. 122. [Milford Township]. Jul. 19 to Jul. 23, 1875.
- Allen, Joseph, Deputy Surveyor. "Field Notes [with accompanying plat] of the Survey of the Subdivisional Lines of Township 113 North, Range 61 West of the 5th Principal Meridian, Dakota Territory." Sub-divisions, Dakota: Vol. 122. [Lake Byron Township]. Aug. 4 to Aug. 9, 1875.
- Allen, Joseph, Deputy Surveyor. "Field Notes [with accompanying plat] of the Survey of the Subdivisional Lines of Township 113 North, Range 62 West of the 5th Principal Meridian, Dakota Territory." Sub-divisions, Dakota: Vol. 122. [Pleasant View Township]. Aug. 10 to Aug. 14, 1875.
- Androit, John L., ed. Township Atlas of the United States. McLean, VA: Androit ASSociates, 1979.
- Bates, Charles H., Deputy Surveyor. "Field Notes [with accompanying plat] of the Survey of the Subdivisional Lines of Township 110 North, Range 65 West of the 5th Principal Meridian, Dakota Territory." Sub-divisions, Dakota: Vol. 324. [Sand Creek Township]. Aug. 23 to Aug. 28, 1881.
- Bates, Charles H., Deputy Surveyor. "Field Notes [with accompanying plat] of the Survey of the Subdivisional Lines of Township 111 North, Range 65 West of the 5th Principal Meridian, Dakota Territory." Sub-divisions, Dakota: Vol. 324. [Wessington Township]. Sept. 22 to Sept. 28, 1881.

- Bates, Charles H., Deputy Surveyor. "Field Notes [with accompanying plat] of the Survey of the Subdivisional Lines of Township 112 North, Range 65 West of the 5th Principal Meridian, Dakota Territory." Sub-divisions, Dakota: Vol. 324. [Whiteside Township]. Sept. 30 to Oct. 6, 1881.
- Blanding, James C., Deputy Surveyor. "Field Notes [with accompanying plat] of the Survey of the Subdivisional Lines of Township 109 North, Range 62 West of the 5th Principal Meridian, Dakota Territory." Sub-divisions, Dakota: Vol. 150. [Grant Township]. May 21 to May 24, 1874.
- Blanding, James C., Deputy Surveyor. "Field Notes [with accompanying plat] of the Survey of the Subdivisional Lines of Township 109 North, Range 63 West of the 5th Principal Meridian, Dakota Territory." Sub-divisions, Dakota: Vol. 153. [Carlyle Township]. May 16 to May 20, 1874.
- Blanding, James C., Deputy Surveyor. "Field Notes [with accompanying plat] of the Survey of the Subdivisional Lines of Township 110 North, Range 62 West of the 5th Principal Meridian, Dakota Territory." Sub-divisions, Dakota: Vol. 150. [Clyde Township]. May 25 to May 28, 1874.
- Blanding, James C., Deputy Surveyor. "Field Notes [with accompanying plat] of the Survey of the Subdivisional Lines of Township 111 North, Range 62 West of the 5th Principal Meridian, Dakota Territory." Sub-divisions, Dakota: Vol. 150. [Theresa Township]. May 29 to Jun. 1, 1874.
- Blanding, James C., Deputy Surveyor. "Field Notes [with accompanying plat] of the Survey of the Subdivisional Lines of Township 112 North, Range 62 West of the 5th Principal Meridian, Dakota Territory." Sub-divisions, Dakota: Vol. 150. [Fairfield Township]. Jun. 2 to Jun. 6, 1874.
- Davis, Raymond E. and Foote, Francis S. Surveying Theory and Practice. New York: McGraw-Hill Book Co., Inc., 1953.
- Directory Service Company, Inc. Beadle County, South Dakota: Rural Resident Directory. Longmont, CO: Directory Service Company, Inc., 1986.

- Green, Charles Lowell. The Administration of the Public Land in South Dakota. Ph.D. dissertation, State University of Iowa, 1939.
- Greene, Herman C., Surveyor. "Field Notes [with accompanying plat] of the Survey of the Subdivisional Lines of Township 109 North, Range 64 West of the 5th Principal Meridian, Dakota Territory." Sub-divisions, Dakota: Vol. 156. [Kellog Township]. Jul. 31 to Aug. 4, 1874.
- Greene, Herman C., Surveyor. "Field Notes [with accompanying plat] of the Survey of the Subdivisional Lines of Township 110 North, Range 63 West of the 5th Principal Meridian, Dakota Territory." Sub-divisions, Dakota: Vol. 153. [Dearborn Township]. Aug. 5 to Aug. 8, 1874.
- Greene, Herman C., Surveyor. "Field Notes [with accompanying plat] of the Survey of the Subdivisional Lines of Township 111 North, Range 63 West of the 5th Principal Meridian, Dakota Territory." Sub-divisions, Dakota: Vol. 153. [Hartland Township]. Aug. 9 to Aug. 12, 1874.
- Greene, Herman C., Surveyor. "Field Notes [with accompanying plat] of the Survey of the Subdivisional Lines of Township 112 North, Range 63 West of the 5th Principal Meridian, Dakota Territory." Sub-divisions, Dakota: Vol. 153. [Broadland Township]. Aug. 13 to Aug. 17, 1874.
- Johnson, J.B. The Theory and Practice of Surveying. New York: John Wiley and Sons, 1904.
- Jones, Mildred McEwen. Early Beadle County: 1829-1900. Huron, SD: F.H. Brown Printing Co., 1961.
- Long, John H., ed. Historical Atlas and Chronology of County Boundaries. 5 vols. Boston: G.K. Hall & Co., 1984. Vol. 5: Minnesota, North Dakota, South Dakota, comp. Mark P. Donovan (North and South Dakota) and Jeffrey D. Sibert (Minnesota).
- Manual of the Principal Instruments Used in American Engineering and Surveying. Troy, NY: W.& L.E. Gurley, 1878.

- Mellen, John N., Surveyor. "Field Notes [and accompanying plat] of the Survey of the Subdivisional Lines of Township 113 North, Range 65 West of the 5th Principal Meridian, Dakota Territory." Sub-divisions, Dakota: Vol. 169. [Nance Township]. Apr. 20 to Apr. 24, 1882.
- U.S. Department of Agriculture. Soil Survey of Beadle County, South Dakota. Soil Conservation Service in cooperation with South Dakota Agricultural Experimentation Station, by Dennis M. Heil. Washington, D.C.: U.S. Government Printing Office, 1979.
- U.S. Department of the Interior. Surveying Our Public Land. Bureau of Land Management. Washington, D.C.: U.S. Government Printing Office, 1980.
- U.S. Department of the Interior. A History of the Rectangular Survey System. Bureau of Land Management, by C. Albert White. Washington, D.C.: U.S. Government Printing Office, 1983.
- U.S. Geological Survey. Huron, Western United States, 1:250,000. Defense Mapping Agency, map no. NL 14-11. Denver, CO: U.S. Geological Survey, 1976.
- U.S. Geological Survey. Watertown, Western United States, 1:250,000. Defense Mapping Agency, map no. NL 14-121. Denver, CO: U.S. Geological Survey, 198176.
- VanAntwerp, Edwin H., Deputy Surveyor. "Field Notes [and accompanying plat] of the Survey of the Subdivisional Lines of Township 109 North, Range 59 West of the 5th Principal Meridian, Dakota Territory." Sub-divisions, Dakota: Vol. 141. [Belle Prairie Township]. Sept. 20 to Sept. 24, 1874.
- VanAntwerp, Edwin H., Deputy Surveyor. "Field Notes [and accompanying plat] of the Survey of the Subdivisional Lines of Township 109 North, Range 60 West of the 5th Principal Meridian, Dakota Territory." Sub-divisions, Dakota: Vol. 77. [Pearl Creek Township]. Sept. 30 to Oct. 4, 1874.

- VanAntwerp, Edwin H., Deputy Surveyor. "Field Notes [and accompanying plat] of the Survey of the Subdivisional Lines of Township 109 North, Range 61 West of the 5th Principal Meridian, Dakota Territory." Sub-divisions, Dakota: Vol. 80. [Clifton Township]. Jul. 24 to Jul. 28, 1874.
- VanAntwerp, Edwin H., Deputy Surveyor. "Field Notes [and accompanying plat] of the Survey of the Subdivisional Lines of Township 110 North, Range 59 West of the 5th Principal Meridian, Dakota Territory." Sub-divisions, Dakota: Vol. 141. [Logan Township]. Sept. 15 to Sept. 19, 1874.
- VanAntwerp, Edwin H., Deputy Surveyor. "Field Notes [and accompanying plat] of the Survey of the Subdivisional Lines of Township 110 North, Range 60 West of the 5th Principal Meridian, Dakota Territory." Sub-divisions, Dakota: Vol. 77. [Richland Township]. Sept. 25 to Sept. 29, 1874.
- VanAntwerp, Edwin H., Deputy Surveyor. "Field Notes [and accompanying plat] of the Survey of the Subdivisional Lines of Township 110 North, Range 61 West of the 5th Principal Meridian, Dakota Territory." Sub-divisions, Dakota: Vol. 80. [Custer Township]. Jul. 30 to Aug. 4, 1874.
- VanAntwerp, Edwin H., Deputy Surveyor. "Field Notes [and accompanying plat] of the Survey of the Subdivisional Lines of Township 110 North, Range 64 West of the 5th Principal Meridian, Dakota Territory." Sub-divisions, Dakota: Vol. 266. [Vernon Township]. Aug. 4 to Aug. 8, 1877.
- VanAntwerp, Edwin H., Deputy Surveyor. "Field Notes [and accompanying plat] of the Survey of the Subdivisional Lines of Township 111 North, Range 59 West of the 5th Principal Meridian, Dakota Territory." Sub-divisions, Dakota: Vol. 141. [Banner Township]. Sept. 9 to Sept. 13, 1874.
- VanAntwerp, Edwin H., Deputy Surveyor. "Field Notes [and accompanying plat] of the Survey of the Subdivisional Lines of Township 111 North, Range 60 West of the 5th Principal Meridian, Dakota Territory." Sub-divisions, Dakota: Vol. 77. [Cavour Township]. Aug. 27 to Sept. 1, 1874.

VanAntwerp, Edwin H., Deputy Surveyor. "Field Notes [and accompanying plat] of the Survey of the Subdivisional Lines of Township 111 North, Range 61 West of the 5th Principal Meridian, Dakota Territory." Sub-divisions, Dakota: Vol. 80. [Valley Township]. Aug. 6 to Aug. 11, 1874.

VanAntwerp, Edwin H., Deputy Surveyor. "Field Notes [and accompanying plat] of the Survey of the Subdivisional Lines of Township 111 North, Range 64 West of the 5th Principal Meridian, Dakota Territory." Sub-divisions, Dakota: Vol. 266. [Wolsey Township]. Aug. 9 to Aug. 13, 1877.

VanAntwerp, Edwin H., Deputy Surveyor. "Field Notes [and accompanying plat] of the Survey of the Subdivisional Lines of Township 112 North, Range 59 West of the 5th Principal Meridian, Dakota Territory." Sub-divisions, Dakota: Vol. 141. [Foster Township]. Sept. 3 to Sept. 7, 1874.

VanAntwerp, Edwin H., Deputy Surveyor. "Field Notes [and accompanying plat] of the Survey of the Subdivisional Lines of Township 112 North, Range 60 West of the 5th Principal Meridian, Dakota Territory." Subdivisions, Dakota: Vol. 77. [Liberty Township]. Aug. 20 to Aug. 25, 1874.

VanAntwerp, Edwin H., Deputy Surveyor. "Field Notes [and accompanying plat] of the Survey of the Subdivisional Lines of Township 112 North, Range 61 West of the 5th Principal Meridian, Dakota Territory." Sub-divisions, Dakota: Vol. 80. [Iowa Township]. Aug. 13 to Aug. 18, 1874.

VanAntwerp, Edwin H., Deputy Surveyor. "Field Notes [and accompanying plat] of the Survey of the Subdivisional Lines of Township 112 North, Range 64 West of the 5th Principal Meridian, Dakota Territory." Sub-divisions, Dakota: Vol. 266. [Allen Township]. Aug. 14 to Aug. 18, 1877.

VanAntwerp, Edwin H., Deputy Surveyor. "Field Notes [and accompanying plat] of the Survey of the Subdivisional Lines of Township 113 North, Range 59 West of the 5th Principal Meridian, Dakota Territory." Sub-divisions, Dakota: Vol. 121. [Barrett Township]. Jul. 19 to Jul. 24, 1875.

VanAntwerp, Edwin H., Deputy Surveyor. "Field Notes [and accompanying plat] of the Survey of the Subdivisional Lines of Township 113 North, Range 63 West of the 5th Principal Meridian, Dakota Territory. Sub-divisions, Dakota: Vol. 265. [Altoona Township]. Aug. 25 to Aug. 28, 1877.

VanAntwerp, Edwin H., Deputy Surveyor. "Field Notes [and accompanying plat] of the Survey of the Subdivisional Lines of Township 113 North, Range 64 West of the 5th Principal Meridian, Dakota Territory." Sub-divisions, Dakota: Vol. 266. [Bonilla Township]. Aug. 19 to Aug. 23, 1877.

Wooley, Miles T., Deputy Surveyor. "Field Notes [and accompanying plat] of the Survey of the Subdivisional Lines of Township 109 North, Range 65 West of the 5th Principal Meridian, Dakota Territory." Sub-divisions, Dakota: Vol. 324. [Burr Oak Township]. Oct. 18 to Nov. 7, 1881.

